UNDERGRADUATE APPROVED COURSES

Course Numbering System

The first digit of the course number determines the level of the course, and the last two digits identify the course. Courses ending with the numeral 8 or 9 are the only courses that are repeatable for credit. Course levels are designated as follows:

- 000-099: Non-credit courses
- 100-199: Courses primarily for first-year students
- 200-299: Courses primarily for sophomore students
- 300-399: Junior/Senior courses (not acceptable for credit toward graduate degrees)
- 400-499: Junior/Senior courses (acceptable for credit toward some graduate degrees)
- 500-599: Professional school courses (Dentistry, Law, Medicine) or post-baccalaureate course (not for graduate degree credit)
- 600-898: Courses restricted to graduate students
- 799: Master's Thesis credit
- 899: Doctoral Dissertation credit

A

- AAAS - African American and Africana Studies (p. 3)
- AAST - Asian American Studies (p. 8)
- ABRM - Anti-Black Racism (p. 10)
- AGNR - Agriculture and Natural Resources (p. 10)
- AGST - Agricultural Science and Technology (p. 11)
- AIME - Artificial Intelligence Interdisciplinary Education (p. 12)
- AMSC - Applied Mathematics & Scientific Computation (p. 13)
- AMST - American Studies (p. 13)
- AMTX - American Studies Education Abroad (https://academiccatalog.umd.edu/undergraduate/approved-courses/amtx/)
- ANSC - Animal Science (p. 16)
- ANTH - Anthropology (p. 21)
- AOSC - Atmospheric and Oceanic Science (p. 26)
- ARAB - Arabic (p. 29)
- ARCH - Architecture (p. 32)
- AREC - Agricultural and Resource Economics (p. 36)
- ARHU - Arts and Humanities (p. 40)
- ARHX - Art History & Archaeology Education Abroad (p. 43)
- ARMY - Army (p. 45)
- ARSC - Air Science (p. 45)
- ARTH - Art History & Archaeology (p. 46)
- ARTT - Art Studio (p. 49)
- ARTX - Art Studio Education Abroad (p. 52)
- ARUX - Arts and Humanities Education Abroad (p. 52)
- ASTR - Astronomy (p. 53)

B

- BCHM - Biochemistry (p. 55)
- BIOE - Bioengineering (p. 56)
- BIOM - Biometrics (p. 60)
- BMGT - Business and Management (p. 60)
- BMIN - General Business Minor (p. 70)
- BSCI - Biological Sciences Program (p. 71)
- BSOS - Behavioral and Social Sciences (p. 80)
- BSST - Terrorism Studies (p. 82)

C

- CCJS - Criminology and Criminal Justice (p. 84)
- CHBE - Chemical and Biomolecular Engineering (p. 87)
- CHEM - Chemistry (p. 93)
- CHIN - Chinese (p. 96)
- CHSE - Counseling, Higher Education, and Special Education (p. 92)
- CINE - Cinema and Media Studies (p. 99)
- CINX - Cinema and Media Studies Education Abroad (p. 103)
- CLAS - Classics (p. 105)
- CLAX - Classics Education Abroad (p. 108)
- CMLT - Comparative Literature (p. 108)
- CMLX - Comparative Literature Education Abroad (p. 109)
- CMNS - Computer, Math, and Natural Sciences (p. 109)
- CMSC - Computer Science (p. 109)
- COMM - Communication (p. 115)
- COMX - Communication Education Abroad (p. 121)
- CPBE - College Park Scholars-Business, Society, and Entrepreneurship (p. 122)
- CPCV - College Park Scholars-Civic Engagement for Social Good (p. 122)
- CPDJ - College Park Scholars-Data Justice (p. 123)
- CPET - College Park Scholars-Environment, Technology & Economy (p. 124)
- CPGH - College Park Scholars-Global Public Health (p. 124)
- CPJT - College Park Scholars-Justice and Legal Thought (p. 125)
- CPMS - College Park Scholars-Media, Self and Society (p. 125)
- CPPL - College Park Scholars-Public Leadership (p. 126)
- CPSA - College Park Scholars-Arts (p. 126)
- CPSD - College Park Scholars-Science, Discovery & the Universe (p. 126)
- CPSF - College Park Scholars-Life Sciences (p. 127)
- CPSG - College Park Scholars-Science and Global Change (p. 127)
- CPSN - College Park Scholars-International Studies (p. 128)
- CPSP - College Park Scholars Program (p. 128)
- CPSS - College Park Scholars-Science, Technology and Society (p. 130)

D

- DANC - Dance (p. 131)
- DATA - Data Science and Analytics (p. 133)

E

- EALL - East Asian Languages and Literatures (p. 134)
- ECON - Economics (p. 134)
- EDCI - Curriculum and Instruction (p. 142)

- EDCP - Education Counseling and Personnel Services (p. 143)
- EDDI - Education Dialogues (p. 143)
- EDHD - Education, Human Development (p. 144)
- EDHI - Education Leadership, Higher Ed and International Ed (p. 148)
- EDMS - Measurement, Statistics, and Evaluation (p. 149)
- EDPS - Education Policy Studies (p. 149)
- EDSP - Education, Special (p. 149)
- EDUC - Education (p. 153)
- ENAE - Engineering, Aerospace (p. 153)
- ENBC - Biocomputational Engineering (p. 157)
- ENCE - Engineering, Civil (p. 160)
- ENEB - Cyber-Physical Systems Engineering (p. 166)
- ENED - Engineering Education (p. 169)
- ENEE - Electrical & Computer Engineering (p. 170)
- ENES - Engineering Science (p. 178)
- ENFP - Engineering, Fire Protection (p. 184)
- ENGL - English (p. 186)
- ENGX - English Education Abroad (p. 202)
- ENMA - Engineering, Materials (p. 208)
- ENME - Engineering, Mechanical (p. 212)
- ENMT - Mechatronics Engineering (p. 218)
- ENRE - Reliability Engineering (p. 220)
- ENSP - Environmental Science and Policy (p. 220)
- ENST - Environmental Science and Technology (p. 222)
- ENTE - Engineering Test and Evaluation (p. 227)
- ENVH - Environmental and Occupational Health (https://academiccatalog.umd.edu/undergraduate/approved-courses/envh/)
- EPIB - Epidemiology and Biostatistics (p. 228)

F

- FGSM - Federal and Global Fellows (p. 228)
- FIRE - First-Year Innovation & Research Experience (p. 229)
- FMSC - Family Science (p. 229)
- FREN - French (p. 233)
- FREX - French Education Abroad (https://academiccatalog.umd.edu/undergraduate/approved-courses/frex/)

G

- GBHL - Global Health (p. 235)
- GEMS - Gemstone (p. 236)
- GEOG - Geographical Sciences (p. 237)
- GEOL - Geology (p. 242)
- GERS - German Studies (p. 246)
- GERX - Germanic Studies Education Abroad (https://academiccatalog.umd.edu/undergraduate/approved-courses/gerx/)
- GFPL - Global and Foreign Policy (p. 250)
- GLBC - Global Culture and Thought (https://academiccatalog.umd.edu/undergraduate/approved-courses/glbc/)
- GREK - Greek (p. 251)
- GVPT - Government and Politics (p. 252)

H

- HACS - ACES-Cybersecurity (p. 259)
- HBUS - Interdisciplinary Business Honors (p. 262)
- HDCC - Design Cultures and Creativity (p. 263)
- HEBR - Hebrew (p. 263)
- HEIP - Entrepreneurship and Innovation (p. 265)
- HESI - Higher Ed, Student Affairs, and International Ed Policy (p. 265)
- HESP - Hearing and Speech Sciences (p. 266)
- HGLO - Honors Global Communities (p. 269)
- HHUM - Honors Humanities (p. 270)
- HISP - Historic Preservation (p. 271)
- HIST - History (p. 271)
- HISX - History Education Abroad (p. 284)
- HLSA - Health Services Administration (p. 285)
- HLSC - Integrated Life Sciences (p. 286)
- HLTH - Health (p. 287)
- HNUH - University Honors (p. 290)
- HONR - Honors (p. 303)

I

- IDEA - Academy for Innovation & Entrepreneurship (p. 304)
- IMDM - Immersive Media Design (p. 305)
- IMMR - Immigration Studies (p. 307)
- INAG - Institute of Applied Agriculture (p. 308)
- INST - Information Studies (p. 311)
- ISRL - Israel Studies (p. 320)
- ITAL - Italian (p. 322)
- ITAX - Italian Education Abroad (p. 325)
- IVSP - Individual Studies Program (p. 326)

J

- JAPN - Japanese (p. 326)
- JOUR - Journalism (p. 327)
- JWST - Jewish Studies (p. 332)

K

- KNES - Kinesiology (p. 338)
- KORA - Korean (p. 345)

L

- LACS - Latin American and Caribbean Studies (p. 346)
- LARC - Landscape Architecture (p. 347)
- LASX - Certificate in Latin American Studies Education Abroad (p. 350)
- LATN - Latin (p. 350)
- LATX - Latin Education Abroad (https://academiccatalog.umd.edu/undergraduate/approved-courses/latx/)
- LBSC - Library Science (p. 351)
- LEAD - Leadership Education and Development (p. 351)
- LGBT - Lesbian Gay Bisexual Transgender Studies (p. 352)
- LGBX - Lesbian Gay Bisexual Transgender Studies Education Abroad (p. 354)

- LING - Linguistics (p. 354)
- LINX - Linguistics Education Abroad (https://academiccatalog.umd.edu/undergraduate/approved-courses/linx/)

M

- MATH - Mathematics (p. 356)
- MEES - Marine-Estuarine-Environmental Sciences (p. 361)
- MFRI - Maryland Fire and Rescue Institute (https://academiccatalog.umd.edu/undergraduate/approved-courses/mfri/)
- MIEH - Maryland Institute for Applied Environmental Health (p. 362)
- MITH - Maryland Institute for Technology in the Humanities (p. 363)
- MLAW - MPower Undergraduate Law Programs (p. 363)
- MLSC - MD Language Science Ctr (p. 364)
- MUED - Music Education (p. 365)
- MUET - Ethnomusicology (p. 366)
- MUSC - School of Music (p. 366)
- MUSP - Music Performance (p. 371)

N

- NAVY - Navy (p. 371)
- NEUR - Neuroscience (p. 373)
- NFSC - Nutrition and Food Science (p. 373)

O

- OURS - Office of Undergraduate Research (p. 376)

P

- PEER - Health Center (p. 377)
- PERS - Persian (p. 379)
- PHIL - Philosophy (p. 381)
- PHIX - Philosophy Education Abroad (p. 386)
- PHPE - Philosophy, Politics, and Economics (p. 386)
- PHPX - Philosophy, Politics, and Economics Education Abroad (p. 387)
- PHSC - Public Health Science (p. 388)
- PHYS - Physics (p. 390)
- PLCY - Public Policy (p. 395)
- PLSC - Plant Sciences (p. 397)
- PORT - Portuguese (p. 402)
- PSIT - Public Service Interpreting and Translation (p. 403)
- PSYC - Psychology (p. 404)

Q

- QMMS - Quantitative Methodology: Measurement and Statistics (p. 409)

R

- RDEV - Real Estate Development (p. 410)
- RELS - Religious Studies (p. 411)
- RELX - Religious Studies Education Abroad (p. 413)
- RUSS - Russian (p. 413)

S

- SDSB - Social Data Science, BSOS (p. 415)
- SDSI - Social Data Science, INFO (p. 416)
- SLAA - Second Language Acquisition and Application (p. 416)
- SLLC - School of Languages, Literatures and Cultures (p. 417)
- SLLX - School of Languages, Literatures & Cultures Education Abroad (p. 419)
- SMLP - Southern Management Leadership Program (p. 421)
- SOCY - Sociology (p. 422)
- SPAN - Spanish (p. 429)
- SPAX - Spanish Education Abroad (p. 437)
- SPHL - Public Health (p. 440)
- STAT - Statistics and Probability (p. 442)
- SURV - Survey and Data Science (p. 443)

T

- TDPS - Theatre, Dance and Performance Studies (p. 443)
- THET - Theatre (p. 444)
- THEX - Theatre Education Abroad (p. 450)
- TLPL - Teaching and Learning, Policy and Leadership (p. 451)
- TLTC - Teaching and Learning Transformation Center (p. 459)

U

- UMEI - Maryland English Institute (p. 459)
- UNIV - University Courses (p. 460)
- URSP - Urban Studies and Planning (p. 461)
- USLT - Latina/o Studies (p. 461)

V

- VIPS - Vertically Integrated Projects (p. 462)

W

- WEID - Words of Engagement Intergroup Dialogue Program (p. 463)
- WGSS - Women, Gender, and Sexuality Studies (p. 463)
- WMSX - Women's Studies Education Abroad (p. 470)

X

- XPER - xFoundry (p. 471)

AAAS - African American and Africana Studies

AAAS100 Introduction to African American and Africana Studies (3 Credits)
Significant aspects of the history of African Americans with particular emphasis on the evolution and development of black communities from slavery to the present. Interdisciplinary introduction to social, political, legal and economic roots of contemporary problems faced by blacks in the United States with applications to the lives of other racial and ethnic minorities in the Americas and in other societies.
Credit Only Granted for: AASP100 or AAAS100.
Formerly: AASP100.

AAAS101 Public Policy and the Black Community (3 Credits)
The impact of public policies on the Black community and the role of the policy process in affecting the social, economic and political well-being of minorities. Particular attention given to the post-1960 to present era.
Credit Only Granted for: AASP101 or AAAS101.
Formerly: AASP101.

AAAS187 The New Jim Crow: African-Americans, Mass Incarceration and the Prison Industrial Complex (3 Credits)
Students will examine the birth of the racial caste system following the abolition of slavery, the parallels between the racial hierarchy of the Jim Crow system and contemporary mass incarceration, and the rise of the prison industrial complex as a multi-billon business which thrives on the oppression of low-income populations and poor communities of color.
Recommended: AASP100.
Credit Only Granted for: AASP187 or AAAS187.
Formerly: AASP187.

AAAS190 HIV/AIDS in a Global Perspective (3 Credits)
Who is getting infected with HIV/AIDS? Who is dying from it? These are two questions that feature prominently on both the domestic and international health agendas. Even though the statistics from Africa garner the greatest global attention, the situation in the US, in particular the DC/Baltimore area and among certain groups, has recently raised concern and intensified the call for action. The goal of this "I" course is to engage students in a critical examination of 1) the factors that put people at risk for getting infected and 2) the factors that determine the type of treatment that people receive in the US as well as globally with a particular focus on Africa and the African diaspora.
Credit Only Granted for: AASP189I or AAAS190.
Formerly: AASP189I.

AAAS200 African Civilization (3 Credits)
A survey of African civilizations from 4500 B.C. to present. Analysis of traditional social systems. Discussion of the impact of European colonization on these civilizations. Analysis of the influence of traditional African social systems on modern African institutions as well as discussion of contemporary processes of Africanization.
Credit Only Granted for: AASP200 or AAAS200.
Formerly: AASP200.

AAAS202 Black Culture in the United States (3 Credits)
The course examines important aspects of African American life and thought which are reflected in African American literature, drama, music and art. Beginning with the cultural heritage of slavery, the course surveys the changing modes of Black creative expression from the 19th-century to the present.
Credit Only Granted for: AASP202 or AAAS202.
Formerly: AASP202.

AAAS210 Intro to Research Design and Analysis in African American and Africana Studies (3 Credits)
Introduces students to quantitative and qualitative research methods used in social science with a focus on Black populations and African American Studies Research. Uses practical exercises, such as class surveys and mock focus groups, to examine fundamental concepts of the research process from conceptualization of research questions to interpretation of data and research articles. The course is designed for undergraduate students with little or no background knowledge in social science research methods.
Credit Only Granted for: AASP210 or AAAS210.
Formerly: AASP210.

AAAS211 Get Out: The Sunken Place of Race Relations in the Post-Racial Era (3 Credits)
Prevailing thought suggests that we live in an era that is post-racial, particularly after the election of Barack Obama. Media often serves to drive our assessment of where our nation stands on issues like race, gender and sexuality. This course uses the film Get Out to delve into the production, evolution and significance of race in present day America. The course will engage multiple forms of media to investigate life in "Post-Racial" America, including but not limited to the role of stereotypes, interracial relationships, police-community relations, etc.
Credit Only Granted for: AASP211 or AAAS211.
Formerly: AASP211.

AAAS230 Social (In)Justice and African-American Health and Well-Being (3 Credits)
African Americans suffer worse outcomes than non-Hispanic whites on nearly every health measure and outcomes that link to overall well-being like depressive symptoms or homicides. Health disparities are experienced by other underrepresented minority groups, but because of the unique historic and current experiences of African Americans, the determinants and solutions to African American health disparities are unique. The premise of this course is that African American health disparities are due to social injustices perpetuated on the institutional level that have permeated the lived experiences of African Americans leading to racial disparities in health and well-being. As such, the solutions on the both policy, and community, level must have a social justice approach.
Credit Only Granted for: AASP230 or AAAS230.
Formerly: AASP230.

AAAS234 African-American Literature and Culture (3 Credits)
An exploration of the stories black authors tell about themselves, their communities, and the nation as informed by time and place, gender, sexuality, and class. African American perspective themes such as art, childhood, sexuality, marriage, alienation and mortality, as well as representations of slavery, Reconstruction, racial violence and the Nadir, legalized racism and segregation, black patriotism and black ex-patriots, the optimism of integration, and the prospects of a post-racial America.
Cross-listed with: ENGL234.
Credit Only Granted for: ENGL234, AAAS234 or AASP298L.

AAAS254 African-American History to 1865 (3 Credits)
Survey of the principal developments in the history and culture of the peoples of African descent in colonial North America and the United States to 1865. Examines the African past, the Atlantic slave trade, variation in slavery, the growth of free black communities, the transformations of families and cultural forms, and patterns of resistance.
Cross-listed with: HIST254.
Credit Only Granted for: HIST254, AAAS254 or AASP298C.

AAAS255 African-American History, 1865 - Present (3 Credits)
An introductory course in the African-American experience in the United States from 1865 to the present. Topics include the aftermath of the Civil War on US race relations, the rise of segregation, northern migration, World War I and II, Civil Rights Movements, and the Black Power Movement.
Cross-listed with: HIST255.
Credit Only Granted for: HIST255, AASP255, AAAS255 or AASP298A.

AAAS260 Africa in World Politics (3 Credits)
Introduction to the politics of Africa, especially Sub-Saharan Africa, on the world stage from the colonial period era to recent push towards democracy in Africa and the rise of religious extremism. It also engages such themes as culture, religion and progress, dictatorship, former colonial powers and international influence, etc.
Credit Only Granted for: AASP260 or AAAS260 .
Formerly: AASP260.

AAAS263 Introduction to Black Women's Studies (3 Credits)
Interdisciplinary exploration of Black women, culture and society in the United States. Drawn primarily from the social sciences and history with complementary material from literature and the arts.
Cross-listed with: WGSS263.
Credit Only Granted for: WMST263, AASP298I, WGSS263, AAAS263 or AASP263.
Formerly: WMST263.

AAAS264 Quare/Queer Contentions: Exploration of Sexualities in the Black Community (3 Credits)
Centering the subjectivities of queer people of color generally and more specifically, Black people (as the word "quare" invites us to do), Quare/Queer Contentions takes up key moments within the history of the Black community and asks us to consider the work and presence of LGBTQ people in these moments. The course also contends with the everyday experiences of LGBTQ subjects in the Black community. Quare/Queer Contentions, therefore, interrogates the material realities of Black queer people in the context of family, religion, cultural/creative work, among others. Interdisciplinary in orientation, the course will employ primary and secondary texts, film, art, autobiographical narratives and policy data.
Cross-listed with: LGBT264, WGSS264.
Credit Only Granted for: LGBT264, AASP264, AAAS264, WMST264 or WGSS264.

AAAS265 Constructions of Manhood and Womanhood in the Black Community (3 Credits)
Investigates the ways that African Americans are represented and constructed in public and private spheres and explores the social constructions and representations of Black manhood and womanhood from various disciplinary perspectives.
Cross-listed with: WGSS265.
Credit Only Granted for: WMST265, AASP298B, AAAS265, WGSS265 or AASP265.
Formerly: WMST265.

AAAS271 Monsters and Racism: Black Horror and Speculative Fiction (3 Credits)
The previous decade has been considered a renaissance for Black Horror. From Get Out to Lovecraft Country, the genre has enjoyed unprecedented mainstream media buzz and accolades. This course looks at contemporary Black horror and speculative fiction as cultural texts which put into question our notions of human(e) and inhuman(e) through critiques of white supremacy and accompanying oppressions. Students will learn a host of critical skills through close reading and analysis of literature and film by Black creators such as Jordan Peele, Misha Green, Toni Morrison, Jewelle Gomez, and Octavia Butler. With the ability to interpret cultural texts using literary criticism, film analysis, history, cultural studies, ethnic studies, feminist theory, and the social sciences, students will connect these texts to continuing historical and contemporary issues of racial and cultural oppression such as medical discrimination, policing and criminalization, misogynoir, and racialized capitalism.
Cross-listed with: WGSS271, ENGL289J.
Credit Only Granted for: AAAS271, ENGL289J, HONR299Y, HNUH238W, WGSS271 or WGSS298W.
Formerly: HNUH238W.

AAAS297 Research Methods in African American and Africana Studies (3 Credits)
Introduces African American and Africana Studies majors to the basic research skills, methodologies, sources, and repositories for studying African Diaspora. Students will be required to select a research topic, write a research proposal, develop an annotated bibliography, and in the process will be prepared for completing their senior thesis or other significant writing projects necessary to fulfill the requirements of the major.
Prerequisite: AAAS101 or AAAS202.
Restriction: Must be in African American and Africana Studies program.
Credit Only Granted for: AASP297 or AAAS297.
Formerly: AASP297.

AAAS298 Special Topics in African American and Africana Studies (3 Credits)
An introductory multi-disciplinary and inter-disciplinary educational experience to explore issues relevant to black life, cultural experiences, and political, economic, and artistic development.
Repeatable to: 6 credits if content differs.
Formerly: AASP298.

AAAS298M Martin Luther King Jr. (3 Credits)
Examines the life and work of Martin Luther King, Jr. We immediately rethink the image of King who liberals and conservatives construct as a dreamer of better race relations. We engage the complexities of an individual, who articulated a moral compass of the nation, to explore racial justice in post-World War II America. This course gives special attention to King's post-1965 radicalism when he called for a reordering of American society, an end to the war in Vietnam, and supported sanitation workers striking for better wages and working conditions. Topics include King's notion of the "beloved community", the Social Gospel, liberalism, "socially conscious democracy", militancy, the politics of martyrdom, poverty and racial justice, and compensatory treatment. Primary sources form the core of our readings.
Cross-listed with: HIST108C, AMST189C.
Credit Only Granted for: HIST108C, AASP298M, AAAS298M, or AMST189C.

AAAS299 Selected Topics in African American and Africana Studies (1-3 Credits)
An introductory multi-disciplinary academic exploration of the cultural, political, and economic issues relevant to Africans and African-Americans.
Repeatable to: 6 credits if content differs.
Formerly: AASP299.

AAAS301 Applied Policy Analysis and the Black Community (3 Credits)
Development and application of the tools needed for examining the effectiveness of alternative policy options confronting minority communities. Review policy research methods used in forming and evaluating policies. Examination of the policy process.
Prerequisite: AAAS101.
Recommended: Completion of one semester of statistics is recommended.
Credit Only Granted for: AASP301 or AAAS301.
Formerly: AASP301.

AAAS306 Race, Gender and Artificial Intelligence (AI) (3 Credits)
With the recent rise of accessible AI technologies, concerns about not only the potential flaws built into technology but also the impact of those issues on already marginalized communities loom large. From medical applications of AI in the personalizing of treatment and disease diagnosis, to the use of facial recognition software in the criminal justice system, AI is being integrated into all facets of everyday life. This class will explore the intersection of Artificial Intelligence (AI), race, and gender. There will be assigned readings on race, gender, difference, algorithms, and artificial intelligence. Students will engage with AI platforms, such as ChatGPT or Peo to gain hands-on experience about the platforms and how they work.

AAAS310 African Slave Trade (3 Credits)
The relationship of the slave trade of Africans to the development of British capitalism and its industrial revolution; and to the economic and social development of the Americas.
Prerequisite: AAAS202 or AAAS100; or permission of BSOS-African American and Africana Studies department.
Credit Only Granted for: AASP310 or AAAS310.
Formerly: AASP310.

AAAS313 Black Women in United States History (3 Credits)
Black American women's history from slavery to the present. Focused on gaining a fuller understanding of the effect of race, class and gender on the life cycles and multiple roles of Black women as mothers, daughters, wives, workers and social-change agents.
Cross-listed with: WGSS314.
Restriction: Sophomore standing or higher.
Credit Only Granted for: AASP313, AAAS313, WMST314 or WGSS314.
Formerly: WMST314.

AAAS317 Black in Latin America and the Caribbean (3 Credits)
The goal of this course is to have an understanding of race, color, and blackness across the Americas. We will compare and contrast forms of racial categorization, discrimination, and ideologies, whether in the form of nation-building projects, addressing racial inequality, or sexuality and family formation. We will draw primarily on social science perspectives, including the work of sociologists and political scientists.
Credit Only Granted for: AASP317 or AAAS317.
Formerly: AASP317.

AAAS320 Poverty and African American Children (3 Credits)
The United States has high levels of child poverty compared to other industrialized nations. Poverty rates are particularly high among African American children. This course focuses on how poverty and race intersect to influence the development of children and youth. Specific topics that we will consider include definitions of poverty, theories about the causes of poverty, racial disparities in child poverty, family functioning in the context of poverty, neighborhood influences, risk and protective processes, and social policies and programs designed to mitigate the impact of poverty.
Cross-listed with: SOCY320.
Credit Only Granted for: AASP320, AAAS320, AASP298P or SOCY320.
Formerly: AASP298P.

AAAS330 Music of the African Diaspora: From Jazz to Modern Black Music (3 Credits)
The goal of this course is to explore a myriad of musical traditions created by Africans in the Diaspora, especially the music of African Americans. Explorations will notably encompass the infusion of Western/Classical Music and its mixing with "Black Music." The traditions and musical styles are related to experiences of culture, history, customs, legends, aesthetic musical forms, and the functional use of this music (e.g., Blues, Jazz, Gospel, Spirituals, Black Message Music, Neo Soul, RAP, and Hip-Hop) as a cultural repository. This cultural repository has subsequently impacted American history, the arts, literature, global values, and Diaspora Studies.
Credit Only Granted for: AASP330 or AAAS330.
Formerly: AASP330.

AAAS361 Caribbean Women (3 Credits)
An interdisciplinary analysis of the lives and experiences of women across the Caribbean region, through an examination of their roles in individual, national, social and cultural formations. Special emphasis on contemporary women's issues and organizations.
Cross-listed with: WGSS360.
Credit Only Granted for: WGSS360, WMST360, AAAS361 or AASP361.
Formerly: WMST360.

AAAS371 Black Feminist Thought (3 Credits)
Examines the ideas, words and actions of Black women writers, speakers, artists, and activists in the United States.
Prerequisite: 1 course in AASP; or 1 course in WGSS.
Cross-listed with: WGSS370.
Credit Only Granted for: WMST370, WGSS370, AAAS371 or AASP371.
Formerly: WMST370.

AAAS386 Experiential Learning (3-6 Credits)
Updating course code to align with department name change
Restriction: Permission of BSOS-African American and Africana Studies department; and junior standing or higher.
Credit Only Granted for: AASP386 or AAAS386.
Formerly: AASP386.

AAAS395 Fundamentals of Quantitative Research in Socio-Cultural Perspective (3 Credits)
Introduction to quantitative methods for African American and Africana Studies majors in the cultural and social analysis concentration. Basics of survey design and experimental design and data analysis and use of statistical software programs.
Restriction: Must be in African American and Africana Studies program; and junior standing or higher.
Credit Only Granted for: AASP395 or AAAS395.
Formerly: AASP395.

AAAS397 Senior Thesis (3 Credits)
Directed research in African American Studies resulting in the completion and defense of a senior thesis.
Restriction: Permission of BSOS-African American and Africana Studies department.
Credit Only Granted for: AASP397 or AAAS397.
Formerly: AASP397.

AAAS398 Selected Topics in the African Diaspora (3 Credits)
Analysis of the historical experiences and cultures of African-descendant peoples globally.
Repeatable to: 6 credits if content differs.
Formerly: AASP398.

AAAS399 Research in African-American and Africana Studies (1-3 Credits)
African American Studies research labs are the settings in which the most recent scholarly work of each faculty member takes place with the enterprise of conducting and disseminating research. Faculty members operate as the team leader and faculty mentor working with undergraduate students around a specific research topic or project. Students will have the opportunity to assist with reviewing literature, data gathering, data management, coding analysis, and the preparation of conference presentations and scholarly publications while advancing their own scholarship and interests, cultivating integrative skills, and gain training in a specialized aspect of the African American Studies discipline, which may not be otherwise available from other experiences on campus.
Prerequisite: Two of the following courses: AAAS100, AAAS101, AAAS200, or AAAS202.
Recommended: AASP210 or equivalent.
Restriction: Must be in the Africa-American and Africana Studies major; and must have completed 30 credits; and must have earned a minimum cumulative GPA of 2.00.
Repeatable to: 6 credits.
Formerly: AASP399.

AAAS400 Directed Readings in African American and Africana Studies (3 Credits)
The readings will be directed by the faculty of African American Studies. Topics to be covered will be chosen to meet the needs and interests of individual students.
Prerequisite: AAAS202 or AAAS100.
Credit Only Granted for: AASP400 or AAAS400.
Formerly: AASP400.

AAAS402 Classic Readings in African American and Africana Studies (3 Credits)
Classic readings of the social, economic and political status of Blacks and other minorities in the United States and the Americas.
Prerequisite: AAAS202 or AAAS100.
Credit Only Granted for: AASP402 or AAAS402.
Formerly: AASP402.

AAAS403 The Development of a Black Aesthetic (3 Credits)
An analysis of selected areas of black creative expression in the arts for the purpose of understanding the informing principles of style, techniques, and cultural expression which make up a Black aesthetic.
Prerequisite: ENGL443 or AAAS302; or permission of instructor.

AAAS410 Contemporary African Ideologies (3 Credits)
Analysis of contemporary African ideologies. Emphasis on philosophies of Nyerere, Nkrumah, Senghor, Sekou Toure, Kaunda, Cabral, et al. Discussion of the role of African ideologies on modernization and social change.
Credit Only Granted for: AASP410 or AAAS410.
Formerly: AASP410.

AAAS411 Black Resistance Movements (3 Credits)
A comparative study of the Black resistance movements in Africa and America; analysis of their interrelationships as well as their impact on contemporary pan-Africanism.
Prerequisite: AAAS100.
Credit Only Granted for: AASP411 or AAAS411.
Formerly: AASP411.

AAAS413 Gentrification: Have You Met the New Neighbors?: Issues of Belonging and Displacement in Urban Areas (3 Credits)
Explores and considers current scholarship on the history, modes and implications of the process of gentrification in various areas within the United States. The course will engage with history, culture, and policy factors related to the redevelopment of urban areas. Course texts will be interdisciplinary in their methodology and genre, and will include themes of race, gender, and class. These texts, combined with student engagement, class discussion, and directed assignments will help to develop a theoretical framework for the understanding of gentrification as systematic, profound and in most if not all cases, irreversibly detrimental.
Credit Only Granted for: AASP413 or AAAS413.
Formerly: AASP413.

AAAS441 Science, Technology, and the Black Community (3 Credits)
Scientific knowledge and skills in solving technological and social problems, particularly those faced by the Black community. Examines the evolution and development of African and African, African American, and Africa Diasporic contributions to science. Surveys the impact of technological changes on minority communities.
Prerequisite: HIST255, AAAS202, or AAAS100; or permission of BSOS-African American and Africana Studies department.
Credit Only Granted for: AASP441 or AAAS441.
Formerly: AASP441.

AAAS443 Law and the Black Community (3 Credits)
The relationship between Black Americans and the law, particularly criminal law, criminal institutions and the criminal justice system. Examines historical changes in the legal status of blacks and changes in the causes of racial disparities in criminal involvement and punishments.
Prerequisite: HIST255, AAAS202, or AAAS100; or permission of BSOS-African American and Africana Studies department.
Credit Only Granted for: AASP443 or AAAS443.
Formerly: AASP443.

AAAS468 Special Topics in Africa and the Americas (3 Credits)
Cultural, historical and artistic dimensions of the African experience in Africa, the Americas and the African Diaspora.
Repeatable to: 6 credits if content differs.
Formerly: AASP468.

AAAS498 Special Topics in Black Culture (3 Credits)
Advanced study of the cultural and historical antecedents of contemporary African and African American society. Emphasis on the social, political, economic and behavioral factors affecting blacks and their communities. Topics vary.
Prerequisite: AASP100, AAAS100, AASP202, or AAAS202.
Repeatable to: 6 credits if content differs.
Formerly: AASP498.

AAAS499 Advanced Topics in Public Policy and the Black Community (3 Credits)
Examination of specific areas of policy development and evaluation in black and other communities. Application of advanced tools of policy analysis, especially quantitative, statistical and micro-economic analysis.
Prerequisite: AASP301 or AAAS301; or permission of BSOS-African American and Africana Studies department.
Repeatable to: 6 credits if content differs.

AAST - Asian American Studies

AAST200 Introduction to Asian American Studies (3 Credits)
The aggregate experience of Asian Pacific Americans, from developments in the countries of origin to their contemporary issues. The histories of Asian Pacific American groups as well as culture, politics, the media, and stereotypes, viewed from an interdisciplinary perspective.
Cross-listed with: AMST298C.
Credit Only Granted for: AAST200 or AMST298C.

AAST201 Asian American History (3 Credits)
Introduction to the history of Asian Americans and Asians in the United States and the Americas and to the field of Asian American Studies, from an interdisciplinary perspective. Topics include theories of race and ethnicity; Asian migration and diaspora to the Americas; Asian American work and labor issues; gender, family, and communities; nationalism and nativism, and anti-Asian movements; Asian Americans in World War II, the Cold War, and the issues in the civil rights & post-civil rights era.
Cross-listed with: HIST221.
Credit Only Granted for: AAST201 or HIST221.

AAST233 Asian American Literature and Culture (3 Credits)
What is the role of literature in the lives of contemporary Asian Americans? How do Asian American authors imagine identity, violence, and social justice? Consider the role of Asian American literature in forming our understanding of past and present Asian America, and explore Asian American cultures and experiences.
Cross-listed with: ENGL233.
Credit Only Granted for: ENGL233 or AAST233.

AAST250 Asian American Foodways (3 Credits)
Kimchi, chop suey, Spam, "curry," poke: while these foods are now widely embraced, we will inquire how "hallmark" Asian/American foods have assumed cultural meaning and significance in the U.S., often through their transnational entanglements with histories of colonialism, exclusion, immigration, war, and globalization. We will think about how the aesthetics and significations of taste are bound up in the ways Asian Americans perceive themselves and are perceived by others, inquiring how ideas of the "perpetual foreigner" and the "model minority" might inform consumption practices. As the title of this course suggests, foodways will be a central area of analysis, never static but defined by mobility and transmission for Asian American communities. You will also be invited to explore your own relationships to Asian American food cultures through personal and academic accounts, a diverse range of media (TV, film, social media), cookbooks, and memoirs.
Credit Only Granted for: AAST298G or AAST250.
Formerly: AAST298G.

AAST262 Asian American Psychology (3 Credits)
An overview of how socio-cultural influences impact the development and psychological health of Asian Americans. Other topics include how minority group status, adaptation and identity development influence various aspects of psychological functioning; the role of historic systematic racism; and, how the COVID-19 pandemic has negatively impacted Asian Americans. Students develop a deeper understanding of the role of stereotypes and racism, acculturation, racial identity development, cultural values, gender socialization, behavioral norms, family roles, stressors and social support systems on the mental health, well-being and health of Asian Americans.
Cross-listed with: PSYC262.
Credit Only Granted for: PSYC262, AAST262 or PSYC489Z.
Formerly: PSYC489Z.

AAST298 Special Topics in Asian American Studies (3 Credits)
An introductory multidisciplinary and interdisciplinary educational experience to explore issues relevant to Asian American life, cultural experiences; and political, economic, and artistic development.
Repeatable to: 6 credits if content differs.

AAST310 Introduction to Comparative Ethnic and Racial Studies (3 Credits)
Introduces students to the study of race and ethnicity in the United States. The class is organized according to the following five units: (1) Introduction; (2) Key concepts; (3) Mechanisms of racial formation; (4) Prevailing myths about race; and (5) Contemporary issues related to race and ethnicity. Through readings, film clips, and presentations, we will explore how the concept of race has developed and endured over time and become familiar with key concepts, such as "race" and "intersectionality". We will attempt to better understand how race is associated with other forms of difference, such as class, gender and ethnicity. We will identify and confront the prevailing myths about race and ethnicity in the United States. Finally, we examine the ways in which contemporary issues reveal the dynamics of race and ethnicity.
Cross-listed with: AMST310.
Credit Only Granted for: AMST310, AAST398F, AAST310, or AMST328L.
Formerly: AMST328L and AAST398F.

AAST322 Immigration and Ethnicity in the US (3 Credits)
Explores historical and contemporary Asian immigration to the US in comparison to and in the context of other immigrant groups. From low-skilled laborers to highly-skilled professionals, Asian and other immigrants have been an integral part of the shifting US economy and society since its inception. The course includes theories on why immigration occurs, determinants of its continuation, the uses of migrant labor, and immigrant adaptation and settlement. The second part of the course focuses on theories of ethnicity and racial formation and how immigrants develop and challenge the definitions of race, ethnicity, the "other", and ultimately, who is American. Students will also have the opportunity to gain first-hand knowledge of the immigrant experience through a life history interview project.
Cross-listed with: SOCY322.
Credit Only Granted for: AAST322, SOCY222, HIST322 or SOCY322.
Formerly: AAST222, SOCY222.

AAST350 South Asian American Experiences (3 Credits)
Explores the historical and current day experiences of diverse South Asian groups in the United States. Drawing from an array of materials, including historical, literary, visual and media texts, the course examines several key issues-- such as immigrant family and generational gap, racial stereotyping, media representation, the intersections of gender, race, and sexuality, the model minority and identity politics, casteism, and interracial relations and ethnic identity formation-- from both national and transnational frameworks for understanding historical and contemporary experiences of South Asian Americans.
Credit Only Granted for: AAST298O or AAST350.
Formerly: AAST298O.

AAST351 Asian Americans and Media (3 Credits)
From yellow peril invaders to model minority allies, Asian Americans have crafted their own dynamic cultural expressions in a number of media from film, television, and music to fashion, sports, and food that reveal and contest the contradictions of the U.S. nation-state. Asian American culture also uniquely sits at the nexus of immigration flows and digital technologies, providing a transnational lens to view the US place in the world. This advanced course, then, will introduce students to the study and practice of Asian American culture as multiple , hybrid, and heterogeneous. It will do so through three sections: section one will introduce students to classical, cultural, and media concepts as well as relevant keywords outlined by Asian American Studies scholars; section two will review the work of Asian American cultural theorists; section three will focus on analyses of particular Asian American cultural productions. In doing so, students will gain an understanding of the shifting and interlocking tensions among the local, the national, and the global that form the cultural geographies of Asian America.
Credit Only Granted for: AAST351, AAST398M or AAST398N.
Formerly: AAST398M, AAST398N.

AAST355 Asian Americans in Film (3 Credits)
Explores how Asian Americans have historically been represented in the U.S. by Hollywood, and in turn, how independent and Hollywood Asian American filmmakers have represented themselves. It covers the history of racial, gendered, and sexualized representations of Asian Americans in Hollywood, as well as Asian American filmic responses within and outside Hollywood. It also introduces how four basic tools of film analysis mise-en-scene, cinematography, editing and sound work together to create meaning in moving images. It examines how these elements are put together in three different types of films by Asian American filmmakers: narrative, documentary, and experimental. How films function in society to circulate ideas that reproduce and challenge stereotypes about Asian Americans.
Cross-listed with: AMST328W.
Credit Only Granted for: AAST355, AAST398L or AMST328W.
Formerly: 398L.

AAST363 Filipino American History and Biography (3 Credits)
Focus is placed on Filipino American experiences with an emphasis on identity, community building and organizing to influence public policy We will cover pertinent events from the US and Philippine history in order to understand the impact of colonialism, migration, immigration and assimilation on Filipino Americans.
Cross-listed with: AMST323.
Credit Only Granted for: AAST363, AMST323, AAST398D, or AMST328J.
Formerly: AAST398D.

AAST378 Experiential Learning (3 Credits)
Field experience/internship in professional organizations and appropriate private and governmental agencies serving the Asian American community.
Restriction: Permission of UGST-Undergraduate Studies.
Repeatable to: 6 credits.

AAST388 Independent Research (1-3 Credits)
Directed, independent study in Asian American Studies resulting in the completion of an original research paper.
Restriction: Permission of UGST-Undergraduate Studies.
Repeatable to: 6 credits if content differs.

AAST394 Growing Up Asian American: The Asian Immigrant Family and the Second Generation (3 Credits)
An interdisciplinary course examines the experiences of children of Asian immigrants in the U.S., focusing on intergenerational dynamics in the Asian immigrant family, their intersections with race, gender, class, sexuality, and religion, and how these shape second-generation Asian American life. Topics include identity and personhood, the model minority myth and education, work and leisure, language and communication, filiality and disownment, mental health and suicide.
Cross-listed with: AMST324, IMMR394.
Credit Only Granted for: AAST394, AAST398E, AMST324, AMST328V, IMMR319G or IMMR394.
Formerly: AAST398E.

AAST398 Selected Topics in Asian American Studies (3 Credits)
Study of a specific theme or issue involving the Asian America experience.
Repeatable to: 6 credits if content differs.

AAST420 Asian American Women: The Social Construction of Gender (3 Credits)
Examines the intersection of gender, race and class as it relates to Asian American women in the United States; how institutionalized cultural and social statuses of gender, race, ethnicity and social class produce and reproduce inequality with implications for Asian Americans and the broader society.
Cross-listed with: WGSS420.
Restriction: Must not have completed WMST420.
Credit Only Granted for: AAST420, WMST420 or WGSS420.

AAST421 Asian American Public Policy (3 Credits)
Using Asian Pacific Americans as a case study, this course will analyze the development of public policy in America. Each week, topics such as community development, voting rights, and the movement to redress the wartime internment of Japanese Americans will serve as backdrops for discussion. We will explore the policy-making roles of legislators, judges, local and national political leaders, journalists, writers, unions, social movements, and community organizations.
Cross-listed with: AMST418N.
Credit Only Granted for: AAST421, AAST498M or AMST418N.
Formerly: AAST498M.

AAST422 Asian American Women and Gender (3 Credits)
Examines Asian/American cultural production along with theories of gender and sexuality in the field of Asian American Studies. We consider how Asian American femininities/masculinities are conceived and circulated, drawing from a diverse selection of twentieth-century and contemporary texts, films and images that connect Asian American bodies to ideas of absence, danger, inscrutability, hyper- or hypo-sexuality, and virulence. Beginning with early to mid-twentieth century representations, the course attends to theories that clarify the contested relationship between the East/West and Asia/U.S. Also examined are the methods through which bodies differentiated by sex, gender, and race are managed, surveilled, and rehabilitated, with close attention to the enduring legacies of American expansionism and conquest, anti-immigration policies in the U.S., and twentieth-century wars and occupations in Asia. The course engages Women of Color feminisms, queer theory, and disability studies.
Cross-listed with: WGSS422.
Credit Only Granted for: AAST498G, AAST422, or WGSS 422.
Formerly: AAST498G.

AAST424 Sociology of Race Relations (3 Credits)
Encourages sociological thinking about US racial and ethnic minority populations, with a focus on African Americans, Latinos, Asian Americans, and Native Americans. The central concern is to understand and explain racial/ethnic inequality. A wide array of topics are discussed, including prejudice and discrimination, slavery, residential segregation, cultural inequality, skin tone stratification, economic and educational disparities, and assimilation/generational processes.
Prerequisite: 6 credits in SOCY courses; or permission of the Sociology department.
Cross-listed with: SOCY424.
Credit Only Granted for: SOCY424 or AAST424.

AAST440 South Asian American Literature and Culture (3 Credits)
Examines writing by South Asian American authors and authors writing about South Asian American issues. It explores major South Asian diaspora themes, considering how migration, war, the events of 9/11, global capitalism, and the changing socio-political and racial scene have affected South Asians in the United States. We will use a transnational approach to consider how writers and filmmakers explore gender, class, religious, caste, and other differences amongst South Asian Americans. We will also examine the place of South Asian Americans in relation to other Asian American populations. We will consider how South Asian American texts disrupt traditional literary classifications based on national identities by reflecting the complex global conditions, imperialistic and capitalistic expansion, and interconnectedness of peoples, nations, and cultures that have transformed American literature and conceptions of American identity.
Credit Only Granted for: AAST440 or AAST498W.
Formerly: AAST498W.

AAST443 Asian American Politics (3 Credits)
Students will gain a greater understanding of 1) the role of Asian Americans in US politics, 2) the political attitudes and behaviors of Asian Americans and 3) how to conduct research on Asian American politics. Though the class will concentrate on Asian Americans, issues related to Asian American politics will be examined within the larger context of America's multicultural political landscape.
Cross-listed with: AMST498J, GVPT368C.
Credit Only Granted for: AAST498T, AAST443, GVPT368C or AMST 498J.
Formerly: AAST498T.

AAST498 Advanced Topics in Asian American Studies (3 Credits)
Advanced study of the cultural and historical antecedents of contemporary Asian American society. Emphasis on the social, political, economic, and behavioral factors affecting Asian Americans and their communities.
Repeatable to: 6 credits if content differs.

AAST499 Senior Thesis (3 Credits)
Under the supervision of faculty, research regarding a specific topic of the Asian American experience will be completed.
Prerequisite: AAST201 and AAST200.
Restriction: Permission of UGST-Undergraduate Studies; and must be in Asian American Studies program.
Repeatable to: 6 credits if content differs.

ABRM - Anti-Black Racism

ABRM330 Introduction to Anti-Black Racism (3 Credits)
This interdisciplinary course seeks to provide a broad overview of this rich and dynamic history. Built around the expertise of top UMD faculty in five colleges, this course will introduce students to the history and legacy of anti-Black racism from the perspective of multiple disciplines. In this course you will examine the development, spread, and articulations of anti-Black racism in the United States.
Additional Information: This interdisciplinary course will consist of two-week modules from key faculty/scholars in College of Behavioral and Social Sciences, College of Arts and Humanities, School of Public Health, School of Public Policy, and College of Education to explore how anti-Black racism operates in society.

ABRM450 Applied Anti-Black Racism (3 Credits)
The purpose of this course is to apply knowledge rooted in Anti-Black Racism to a real-world problem or issue within your chosen discipline or planned career path. You will meet with the course instructor and each other to discuss the readings, ideas and frameworks of anti-Black racism. The rest of the course will operate similar to an independent study; you will choose a mentor from your home department to work with on a self-directed, practice-oriented project. Beginning with a framework rooted in understanding anti-Black racism, you will identify issues of anti-Black racism specific to your discipline, select one of those issues within which to explore current solutions and their shortcomings, and draft a proposal that addresses the anti-Black racism embedded within the issue itself.
Prerequisite: ABRM330.

AGNR - Agriculture and Natural Resources

AGNR100 Agriculture Discovery: An Educational Odyssey Exploring Food, Culture, and the Environment (3 Credits)
Explores the history, cultural impact, and current issues of agriculture. Students are exposed to the wide range of professional opportunities associated with the use of plants and animals in the production and processing of food for human consumption. Students learn from Agriculture and Natural Resources (AGNR) faculty and USDA collaborators through lectures, labs and field trips to facilities in the Baltimore-Washington area.

AGNR200 AGNR 2+2 Program Extended Orientation Seminar (1 Credit)
Introduces AGNR 2+2 students to University and "American" life. Assists with their successful transition to the College and Agriculture and Natural Resources and the University of Maryland. Helps students to understand their place in AGNR at to learn about the resources available to them.
Prerequisite: Must be a first semester international student enrolled in the AGNR 2+2 Program.
Restriction: Must be a first year international student enrolled in the College of Agriculture and Natural Resources 2+2 Program.
Additional Information: It is strongly recommended that AGNR 2+2 students take AGNR 200 during the first semester at the University. One class meeting per week. This courses is initiated by International Programs and will be coordinated in conjunction with the College of AGNR.

AGNR301 Sustainability (3 Credits)
Designed for students whose academic majors would be enhanced by the complementary study of a widely shared but hard-to-operationalize aspiration: that present choices should preserve or improve future options rather than foreclose or degrade them. How should we understand sustainability? How might we achieve it? How would we know if we had achieved it? And how could sustainability activists of a rising generation lead by example?
Cross-listed with: PLCY301, GFPL373.
Credit Only Granted for: AGNR301, GFPL373, or PLCY301.

AGNR386 Experiential Learning (3-6 Credits)
Restriction: Permission of AGNR-College of Agriculture & Natural Resources.
Formerly: AGRI386.

AGNR388 Honors Thesis Research (3-6 Credits)
Undergraduate honors thesis research conducted under the direction of an AGNR faculty member in partial fulfillment of the requirements of the College of AGNR Honors Program. The thesis will be defended to a faculty committee.
Restriction: Must be admitted to AGNR Honors program.
Repeatable to: 6 credits if content differs.
Formerly: AGRI388.

AGNR489 Field Experience (1-4 Credits)
Credit according to time scheduled and organization of the course. A lecture series organized to study in depth a selected phase of agriculture not normally associated with one of the existing programs.
Restriction: Permission of AGNR-College of Agriculture & Natural Resources.
Repeatable to: 4 credits if content differs.
Formerly: AGRI489.

AGNR499 Special Problems (1-3 Credits)
Formerly: AGRI499.

AGST - Agricultural Science and Technology

AGST130 Did Yeast Create Civilization? (3 Credits)
Did yeast create civilization? Fermented foods have played a major role in the transition from nomadic to settled agrarian societies, the establishment of social and religious customs, the expansion of empires, and modern economies. To what extent are our past and current attitudes towards fermented foods rooted in historical and cultural imprints? Explore the central role of fermentation in human history and culture, the basic microbiological processes underlying fermentation processes, and the processes used to produce and distribute fermented foods. Find out how the fruits, grains, and dairy products used to produce fermented foods are grown and selected. Students will learn about the development and modern use of fermented dairy products, pickles, bread, tea, chocolate, wine, beer, distilled liquors, and pharmaceutical/manufactured products.
Recommended: CHEM103, CHEM131, CHEM135, or CHEM146.
Cross-listed with: PLSC130.
Credit Only Granted for: AGST130 or PLSC130.

AGST275 Fundamentals of Agricultural and Environmental Chemistry (3 Credits)
An in-depth discussion of chemistry targeted to students enrolled in plant and animal management curricula offered in AGNR. Covers the nomenclature and basic functional groups in organic chemistry, natural products and pesticides. Current practices of crop, agriculture and environmental management and genetic engineering also discussed.
Prerequisite: Minimum grade of C- in CHEM131 and CHEM132; and minimum grade of C- in (PLSC110 and PLSC11) or (PLSC112 and PLSC113) or (BSCI160 and BSCI161) or (BSCI170 and BSCI171).
Restriction: Must not have completed CHEM104 or CHEM105; and must be in a major within the AGNR-College of Agriculture and Natural Resources; or permission of instructor.
Credit Only Granted for: AGST275 or PLSC275.
Formerly: PLSC275.

AGST333 Crafty Beverage Crops (3 Credits)
From soda to wine, a scientific introduction to "crafty beverage crops". Students will expand their horticulture knowledge and gain an appreciation for craft beverages and the plants that made them. Topics include history, biology, production and management techniques, harvest, storage and market potential for crafty beverage crops.
Recommended: PLSC110 or PLSC112; or 1 course in BSCI, BCHM, BIOL.

AGST389 Internship in Agricultural Education (1-3 Credits)
An experiential learning course with a focus on non-formal agricultural education. This is a supervised learning experience within a career focused environment to assist in refinement of a student's career interests prior to graduation.
Restriction: Permission of the instructor.
Repeatable to: 6 credits if content differs.

AGST399 Special Problems in Agricultural Science & Technology (1-3 Credits)
A problem based learning course with a focus on class or group based research projects in Agricultural Science and Technology with a focus on addressing outreach targeted needs.
Restriction: Permission of the instructor.
Repeatable to: 6 credits if content differs.

AGST400 Advanced Crop Science (3 Credits)
Focuses on the study of the agronomic principles and practices required for the production of food, feed, fiber and fuel crops. This is a project-based course where students will develop a farm plan from knowledge gained in previous courses and built upon in this course. Students will learn to integrate data and information from many sources in order to build and operate a successful and sustainable agronomic farm operation using current and new technology. The use of farm management software will be an integral part of the course and farm project.
Prerequisite: PLSC112, PLSC113, BSCI160, BSCI161, and MATH113 or higher.
Recommended: ANSC101.
Credit Only Granted for: PLSC407 or AGST400.
Formerly: PLSC407.
Additional Information: There will be two required Saturday field trips during the semester. Because of the changing nature of agriculture, the dates of these field trips will be decided upon at the beginning of the semester by discussion among the students and based on cooperators availability and environmental factors. Students will have a minimum of two weeks notice as to the dates of the field trips.

AGST401 Tractor and Equipment Operation, Safety and Maintenance (1 Credit)
Provides students with basic skills needed to safely operate and maintain farm equipment, such as tractors and implements used in agronomic production. Students will receive introductory background training in the basic safety and operation of tractors through hands-on learning. Emphasis will also be placed on the mechanical functioning of equipment and the functional similarities and differences between gasoline (two-stroke and four-stroke) and diesel engines as well as electric motors as they relate to farm equipment (mobile and stationary). This knowledge will be used to teach students to safely perform basic care and maintenance of different tractor types as well as various implements. Students will also learn basic implement connection and disconnection, including the safe use of implements that employ a power take-off unit. Included in the course will be an introduction to the equipment and use of satellite navigation systems used in agronomic production.
Prerequisite: PLSC112 and PLSC113; MATH113 or higher MATH course; and must have completed or be concurrently enrolled in AGST400.
Restriction: Must be in the Agricultural Science and Technology major (01010) with priority given to Agronomy students (0101A); and must have earned a minimum of 60 credits; and permission of the Department of Plant Sciences and Landscape Architecture.
Additional Information: Course location will be the University of Maryland Wye Research & Education Center, Queenstown, Maryland. Because students will be working around machinery with moving parts, there is a strict dress code based on information from the United State Department of Agriculture Cooperative States Research, Education and Extension Service's Hazardous Occupations Safety Training for Agriculture (HOSTA), National Safe Tractor and Machinery Operation Program (NSTMOP) standards. YContact instructor for more information?.

AGST426 Scientists Teaching and Translating Science (3 Credits)
Explore methods in pedagogy, andragogy, and heutagogy to facilitate science learning through the development of a teaching philosophy, outreach teaching skills, motivation in learning, assessment foundations, and review of current literature on instruction in science fields.
Credit Only Granted for: AGST426 or PLSC489L.
Formerly: PLSC489L.

AGST440 Exploring Maryland Agriculture, Agricultural Industry, and Agricultural Literacy (3 Credits)
Explore the mission and history of the Land Grant System as well as current work conducted through the University of Maryland to extend research to citizens. Often referred to as America in miniature, Maryland boasts diverse people, agricultural practices, cultures, and ecosystems which students will examine to perceive the decision making processes within and across ecological systems as well as the development of advisory boards.

AGST442 Examining Leadership in Youth and Volunteers (3 Credits)
Explore fundamental leadership theories and practice related skills utilized in helping youth and adults build community relationships in a variety of teaching environments. Fundamentals of youth development will be the basis for examining how to foster positive learning environments for dynamic learning. The identification of empowerment processes will be explored through case-study discussions.

AGST489 Special Topics in Agricultural Science and Technology (1-3 Credits)
Selected novel topics of study in Agricultural Science & Technology (AGST).
Restriction: Permission of the instructor.
Repeatable to: 9 credits if content differs.

AGST499 Independent Studies in Agricultural Science and Technology (1-3 Credits)
An inquiry based learning course with individualized projects designed by student and faculty focused on: research or advanced learning experiences in Agricultural Science and Technology including field, greenhouse, laboratory, educational site, travel abroad and/or library studies. Conducted under the direction of a faculty member.
Restriction: By permission of instructor.
Repeatable to: 6 credits if content differs.

AIME - Artificial Intelligence Interdisciplinary Education

AIME298 Special Topics in Artificial Intelligence (1-4 Credits)
Thematic exploration of a topic in artificial intelligence (A.I.).
Repeatable to: 9 credits if content differs.

AIME399 Independent Study in Artificial Intelligence (1-3 Credits)
An individualized course of study under the guidance of a faculty mentor or affiliate faculty mentor within the Artificial Intelligence Interdisciplinary Institute at Maryland (AIM). Students are required to create their own course of study in consultation with their faculty advisor; content must not duplicate coursework already offered at the university.
Restriction: Permission of CMNS-Artificial Intelligence Interdisciplinary Institute at Maryland; and junior standing or higher.
Repeatable to: 6 credits if content differs.

AIME498 Interdisciplinary Topics in Artificial Intelligence (1-4 Credits)
Seminar course covering interdisciplinary topics in artificial intelligence.
Restriction: Permission of CMNS-Artificial Intelligence Interdisciplinary Institute at Maryland; and junior standing or higher.
Repeatable to: 9 credits if content differs.

AIME499 Independent Research in Artificial Intelligence (1-6 Credits)
Directed research under the supervision of a faculty member or affiliate faculty member in artificial intelligence. Students and supervising faculty member will agree to a research plan which must be approved by the Artificial Intelligence Interdisciplinary Institute at Maryland (AIM). As part of each research plan, students should produce a final paper on their research.
Restriction: Permission of CMNS-Artificial Intelligence Interdisciplinary Institute at Maryland; and junior standing or higher.
Repeatable to: 9 credits if content differs.

AMSC - Applied Mathematics & Scientific Computation

AMSC420 Mathematical Modeling (3 Credits)
The course will develop skills in data-driven mathematical modeling through individual and group projects. Emphasis will be placed on both analytical and computational methods, and on effective oral and written presentation of results.
Prerequisite: 1 course with a minimum grade of C- from (MATH240, MATH461, MATH341, ENEE290, MATH243); and 1 course with a minimum grade of C- from (MATH241, MATH340); and 1 course with a minimum grade of C- from (MATH246, MATH341, ENEE290, MATH243); and 1 course with a minimum grade of C- from (STAT400, STAT410); and 1 course with a minimum grade C- from (CMSC106, CMSC131).
Recommended: AMSC460 or AMSC466.
Cross-listed with: MATH420.
Credit Only Granted for: AMSC420 or MATH420.

AMSC452 Introduction to Dynamics and Chaos (3 Credits)
An introduction to mathematical dynamics and chaos. Orbits, bifurcations, Cantor sets and horseshoes, symbolic dynamics, fractal dimension, notions of stability, flows and chaos. Includes motivation and historical perspectives, as well as examples of fundamental maps studied in dynamics and applications of dynamics.
Prerequisite: MATH341; or MATH246 and one of (MATH240 or MATH461).
Cross-listed with: MATH452.
Credit Only Granted for: AMSC452 or MATH452.

AMSC460 Computational Methods (3 Credits)
Basic computational methods for interpolation, least squares, approximation, numerical quadrature, numerical solution of polynomial and transcendental equations, systems of linear equations and initial value problems for ordinary differential equations. Emphasis on methods and their computational properties rather than their analytic aspects. Intended primarily for students in the physical and engineering sciences.
Prerequisite: 1 course with a minimum grade of C- from (MATH240, MATH341, MATH461, ENEE290, MATH243); and 1 course with a minimum grade of C- from (MATH241, MATH340); and 1 course with a minimum grade of C- from (CMSC106, CMSC131); and 1 course with a minimum grade of C- from (MATH246, MATH341, ENEE290, MATH243).
Cross-listed with: CMSC460.
Credit Only Granted for: AMSC460, AMSC466, CMSC460, or CMSC466.

AMSC466 Introduction to Numerical Analysis I (3 Credits)
Floating point computations, direct methods for linear systems, interpolation, solution of nonlinear equations.
Prerequisite: 1 course with a minimum grade of C- from (CMSC106, CMSC131); and minimum grade of C- in MATH410.
Cross-listed with: CMSC466.
Credit Only Granted for: AMSC460, CMSC460, AMSC466, or CMSC466.

AMSC498 Selected Topics in Applied Mathematics (1-3 Credits)
Topics in applied mathematics of special interest to advanced undergraduate students.
Repeatable to: 6 credits if content differs.

AMST - American Studies

AMST101 Introduction American Studies (3 Credits)
Introduces students to the interdisciplinary field of American Studies by examining concepts such as culture, identity, cultural practices, and globalization, as well as theories underlying these concepts. Engages key themes, especially constructions of difference and identity, cultures of everyday life, and America and the world.
Credit Only Granted for: AMST101 or AMST201.
Formerly: AMST201.

AMST189C Martin Luther King Jr. (3 Credits)
Examines the life and work of Martin Luther King, Jr. We immediately rethink the image of King who liberals and conservatives construct as a dreamer of better race relations. We engage the complexities of an individual, who articulated a moral compass of the nation, to explore racial justice in post-World War II America. This course gives special attention to King's post-1965 radicalism when he called for a reordering of American society, an end to the war in Vietnam, and supported sanitation workers striking for better wages and working conditions. Topics include King's notion of the "beloved community", the Social Gospel, liberalism, "socially conscious democracy", militancy, the politics of martyrdom, poverty and racial justice, and compensatory treatment. Primary sources form the core of our readings.
Cross-listed with: HIST108C, AAAS298M.
Credit Only Granted for: HIST108C, AASP298M, AAAS298M, or AMST189C.

AMST202 Cultures of Everyday Life in America (3 Credits)
Examine the structures and patterns of everyday life in the U.S., utilizing methods such as ethnography, oral history, survey research, and textual, visual, and material cultural analysis.

AMST203 Popular Culture in America (3 Credits)
An introduction to American popular culture, its historical development, and its role as a reflection of and influence on our culture and society.

AMST204 Film and American Culture Studies (3 Credits)
Exploration of the American film from a historical perspective, illustrating the motion picture's role as an institutional phenomenon, as a form of communication, and as a source of cross-cultural study.

AMST205 American Material Culture: The Study of People, Places, and Things (3 Credits)
Historical survey of American material culture. Ways of describing and interpreting accumulated material evidence (e.g., buildings, town plans) introduced by stressing relationship between artifact and culture.

AMST210 Introduction to Ethnography (3 Credits)
A qualitative research method course used to study social worlds communities, cultures, institutions, and other social groups from the perspectives of the people who inhabit those social worlds. Ethnographic research involves understanding cultural traditions from an insider's perspective by studying the everyday lives of people steeped in those traditions.

AMST212 Diversity in American Culture (3 Credits)
Exploration of the role of diversity in the shaping of American culture. Special emphasis will be placed on the multicultural origins of American popular and material culture, such as foodways and entertainment, and on the experience of "Americanization."

AMST213 Heroes and Villains in American Film (3 Credits)
We will examine the complex, changing, and ever-present representations of heroes and villains in American film. Beginning with a foundational understanding of how heroes and, conversely, villains have been defined through classic Hollywood film, we will explore how these definitions have shifted throughout the 20th and 21st century in various narrative genres, including westerns, war films, film noir, fantasy, science fiction, and, of course, superhero movies. In particular, we will be focusing on how the hero and villain maintain or disrupt specific cultural ideologies concerning race/ethnicity, gender, sexuality, and ability. This course will examine how these various ideologies have evolved throughout the 20th and 21st century, impacting the ways in which heroes and villains are both represented in American film and perceived by diverse audiences. Finally, we will examine our own complicated and sometimes troubling identification with these heroes, even when they might stand in stark contrast to our cultural values and identities.
Cross-listed with: CINE282.
Credit Only Granted for: AMST213, HONR219F, CINE282 or FILM298V.
Formerly: HONR219F, FILM298V.

AMST215 Introduction to Disability Studies (3 Credits)
Explores theories of disability justice as they intersect with feminist and antiracist struggles. Analyzing how disability has been an important aspect of institutions and social experience in the United States and beyond, the course considers how disability activists have responded to ableism by developing art, political strategies, and subcultures that promote a more just society built for a wider variety of human bodies.
Cross-listed with: WGSS105.
Credit Only Granted for: WGSS105, AMST215, or AMST298D.
Formerly: AMST298D.

AMST250 Empire and Settler Colonialism (3 Credits)
Engages with the connections between settler colonialism and empire/imperialism and what their effects are on race, land, dispossession, and migration. The course will begin by grounding students in course key concepts including Settler Colonialism, Empire, Imperialism, Sovereignty, and Legality, situating these concepts in relation to space, place, and geography. The second half of the course will use these theoretical lenses to analyze the social conditions faced by BIPOC peoples. These topics will cover criminalization and police violence, Indigenous and women of color feminist and two spirit/queer experience, environmental racism, and state-based forms of racial documentation. The course will end with a discussion of decolonization and what it means in relation to settler colonialism and empire.

AMST260 American Culture in the Information Age (3 Credits)
Examines the ways in which content and form of public information interact with the culture, families & individuals.
Credit Only Granted for: AMST260 or AMST298I.
Formerly: AMST298I.

AMST262 Houses, Schools, and Prisons in American Life (3 Credits)
This interdisciplinary course explores the role of property, discipline, and punishment in American life. By exploring the ideological underpinnings in property, discipline, and punishment and their manifestations in houses, schools, and prisons we will explore how these entities reflect American society and its values.

AMST269 Special Topics in Study Abroad II (1-6 Credits)
Special topics course taken as part of an approved study abroad program.
Repeatable to: 15 credits if content differs.

AMST290 Constructing Cultural Mainstreams and Margins in the U.S. (3 Credits)
Examines the construction, operation, and meaning of cultural mainstreams and margins in a range of contexts, spaces, and times in the U.S. Using a variety of primary sources, research methods, and interdisciplinary scholarship, we will explore how Americans make and assign meaning to cultural mainstreams and margins. We will examine how and why cultural margins and mainstreams shift over time and what their consequences have been for social policies, laws, power relations, and national identity.
Credit Only Granted for: AMST289A or AMST290.
Formerly: AMST289A.

AMST298 Selected Topics in American Studies (3 Credits)
Cultural study of a specific theme or issue involving artifacts and documents from both past and contemporary American experience.
Repeatable to: 6 credits if content differs.

AMST298Q U.S. Latinx Literature and Culture (3 Credits)
Examines the poetry, prose, and theater of Latinx communities in the United States from their origins in the Spanish colonization of North America to their ongoing development in the 21st century. Considers how authors use literary form to gain insight into human experience, including mortality, religious belief, gender and sexuality, war and peace, family, language use, scientific inquiry, cultural tradition, ecology, and labor. Also studies how Latinx literary traditions have shaped and been shaped by broader currents in American literature, as well as what connections exist between Latinx literature and social and artistic developments in other parts of the world, particularly Latin America and the Caribbean. Authors may include Alvar Nunez Cabeza de Vaca, Eulalia Perez, Juan Nepomuceno Seguin, Maria Amparo Ruiz de Burton, Jose Marti, Arthur A. Schomburg, Jesus Colon, Julia de Burgos, Cesar Chavez, Ariel Dorfman, Gloria Anzaldua, Junot Diaz, and Cristina Garcia.
Cross-listed with: ENGL235.
Credit Only Granted for: ENGL235 or AMST298Q.

AMST310 Introduction to Comparative Ethnic and Racial Studies (3 Credits)
Introduces students to the study of race and ethnicity in the United States. The class is organized according to the following five units: (1) Introduction; (2) Key concepts; (3) Mechanisms of racial formation; (4) Prevailing myths about race; and (5) Contemporary issues related to race and ethnicity. Through readings, film clips, and presentations, we will explore how the concept of race has developed and endured over time and become familiar with key concepts, such as "race" and "intersectionality". We will attempt to better understand how race is associated with other forms of difference, such as class, gender and ethnicity. We will identify and confront the prevailing myths about race and ethnicity in the United States. Finally, we examine the ways in which contemporary issues reveal the dynamics of race and ethnicity.
Cross-listed with: AAST310.
Credit Only Granted for: AMST310, AAST398F, AAST310, or AMST328L.
Formerly: AMST328L and AAST398F.

AMST312 Introduction to Native American and Indigenous Studies (3 Credits)
Key concepts and theories in Native American Studies beginning with an overview of the field and some of its foundational readings and history, then will move into an understanding of Native American identity and representation and a discussion of Indigenous sovereignty and self-determination. The course will outline past and present genocidal practices that seek to eliminate Native people and Indigenous responses to those structures such as the concept of survivance, Native feminisms, and theories of Indigenous resurgence. The course seeks to move students through an understanding of past and present structures affecting Native American people in the United States and Canada and move into readings that highlight Native articulations of present and future agency. While the focus of the course is Native peoples with the United States and Canada, understanding Indigenous histories and concepts always includes a hemispheric and transnational analysis.
Credit Only Granted for: AMST328N, ANTH468F, RELS319N, or AMST312.
Formerly: AMST328N, ANTH468F, or RELS319N.

AMST315 Religion in American Culture (3 Credits)
Introduces students to the world's major religious traditions and examines how American culture informs, and is informed by, the variety of religious beliefs and practices in the U.S. This course is primarily concerned with religion as a system of meaning. The focus of the course is not on the history of religion or on analysis of religious texts, but rather on the meaning of a religion to its believers.
Recommended: AMST101.
Credit Only Granted for: AMST315 or AMST328R.
Formerly: AMST328R.

AMST320 (Dis)ability in American Film (3 Credits)
Explores the connection between film and disability through an analysis of independent and mainstream American films in various film genres. Specifically, we will consider how these film representations reflect and/or challenge the shifting social perspectives of disability over the 20th and 21st centuries. Beginning with the presentation of disability as theatrical spectacle in the traveling sideshow and early cinema, we will work our way through film history to develop an understanding of our society's complicated relationship with disability.
Credit Only Granted for: AMST320 or AMST328X.
Formerly: AMST328X.

AMST323 Filipino American History and Biography (3 Credits)
Focus is placed on Filipino American experiences with an emphasis on identity, community building and organizing to influence public policy We will cover pertinent events from the US and Philippine history in order to understand the impact of colonialism, migration, immigration and assimilation on Filipino Americans.
Cross-listed with: AAST363.
Credit Only Granted for: AAST363, AMST323, AAST398D, or AMST328J.
Formerly: AAST398D.

AMST324 Growing Up Asian American: The Asian Immigrant Family and the Second Generation (3 Credits)
An interdisciplinary course examines the experiences of children of Asian immigrants in the U.S., focusing on intergenerational dynamics in the Asian immigrant family, their intersections with race, gender, class, sexuality, and religion, and how these shape second-generation Asian American life. Topics include identity and personhood, the model minority myth and education, work and leisure, language and communication, filiality and disownment, mental health and suicide.
Cross-listed with: AAST394, IMMR394.
Credit Only Granted for: AAST394, AAST398E, AMST324, AMST328V, IMMR319G or IMMR394.
Formerly: AAST398E.

AMST328 Perspectives on Identity and Culture (3 Credits)
Analysis of the cultural aspect of identity formation and the role of individual or community identities in cultural production. Examination of cultural texts such as film, literature, fashion, artifacts, archival records, architecture, monuments, sports, and paintings.
Repeatable to: 9 credits if content differs.

AMST328W Asian Americans in Film (3 Credits)
Explores how Asian Americans have historically been represented in the U.S. by Hollywood, and in turn, how independent and Hollywood Asian American filmmakers have represented themselves. It covers the history of racial, gendered, and sexualized representations of Asian Americans in Hollywood, as well as Asian American filmic responses within and outside Hollywood. It also introduces how four basic tools of film analysis mise-en-scene, cinematography, editing and sound work together to create meaning in moving images. It examines how these elements are put together in three different types of films by Asian American filmmakers: narrative, documentary, and experimental. How films function in society to circulate ideas that reproduce and challenge stereotypes about Asian Americans.
Cross-listed with: AAST355.
Credit Only Granted for: AAST355, AAST398L or AMST328W.
Formerly: 398L.

AMST340 Introduction to History, Theories and Methods in American Studies (3 Credits)
Introduction to the process of interdisciplinary research, including research literatures, questions, first-hand sources and library and analytic methods in American Studies. Each student will craft a prospectus for original research.
Prerequisite: Must have completed AMST201; and 2 courses in AMST.
Restriction: Must be in American Studies program; and sophomore standing or higher.

AMST369 Special Topics in Study Abroad III (1-6 Credits)
Special topics course taken as part of an approved study abroad program.
Repeatable to: 15 credits if content differs.

AMST386 Experiential Learning (3-6 Credits)
Restriction: Permission of ARHU-American Studies department; and junior standing or higher.

AMST388 Honors Thesis (3-6 Credits)
Individual research, thesis and oral defense. The research project will be conducted under the supervision of a faculty member.
Restriction: Must be admitted to AMST honors program; and permission of ARHU-American Studies department; and senior standing.
Repeatable to: 6 credits if content differs.

AMST398 Independent Studies (1-3 Credits)
Provides the student with the opportunity to pursue independent, interdisciplinary research and reading in specific areas of American culture studies.
Restriction: Permission of ARHU-American Studies department.
Repeatable to: 6 credits if content differs.

AMST418 Cultural Themes in America (3 Credits)
Examination of structure and development of American culture through themes such as "growing up American," "culture and mental disorders," "race," "ethnicity," "regionalism," "landscape," and "humor."
Repeatable to: 6 credits if content differs.

AMST418N Asian American Public Policy (3 Credits)
Using Asian Pacific Americans as a case study, this course will analyze the development of public policy in America. Each week, topics such as community development, voting rights, and the movement to redress the wartime internment of Japanese Americans will serve as backdrops for discussion. We will explore the policy-making roles of legislators, judges, local and national political leaders, journalists, writers, unions, social movements, and community organizations.
Cross-listed with: AAST421.
Credit Only Granted for: AAST421, AAST498M or AMST418N.
Formerly: AAST498M.

AMST425 Film and American Landscape (3 Credits)
Explores how representations of various geographic spaces in American film impact our understanding of community, identity, and place. In particular, we will think about how these spaces are culturally produced and changeable rather than static. The same space can hold diverse meanings for various groups of people and how such a space is represented in film is often wrapped up with issues of power, the reinforcement of stereotypes, and the creation of self/other dichotomies. By analyzing a variety of narrative, documentary, major studio, and independent films, we will seek to understand how American films' representations of rural, urban, and suburban spaces both reflect, contradict, and often influence our lived experiences of these spaces; in other words, this course will examine how the "reel" intersects with the "real".
Credit Only Granted for: AMST418K or AMST425.
Formerly: AMST418K.

AMST428 American Cultural Eras (3 Credits)
Investigation of a decade, period, or generation as a case study in significant social change within an American context. Case studies include "Antebellum America, 1840-1860" and "American culture in the Great Depression."
Repeatable to: 6 credits if content differs.

AMST429 Perspectives on Popular Culture (3 Credits)
Topics in popular culture studies, including the examination of particular genres, themes, and issues.
Repeatable to: 6 credits if content differs.

AMST450 Seminar in American Studies (3 Credits)
Developments in theories and methods of American Studies scholarship, with emphasis upon interaction between the humanities and the social sciences in the process of cultural analysis and evaluation.
Prerequisite: AMST201 and AMST340; and 1 course in AMST.
Restriction: Senior standing; and must be in American Studies program.

AMST498 Special Topics in American Studies (3 Credits)
Topics of special interest.
Repeatable to: 9 credits if content differs.

AMST498J Asian American Politics (3 Credits)
Students will gain a greater understanding of 1) the role of Asian Americans in US politics, 2) the political attitudes and behaviors of Asian Americans and 3) how to conduct research on Asian American politics. Though the class will concentrate on Asian Americans, issues related to Asian American politics will be examined within the larger context of America's multicultural political landscape.
Cross-listed with: AAST443, GVPT368C.
Credit Only Granted for: AAST498T, AAST443, GVPT368C or AMST 498J.
Formerly: AAST498T.

AMST499 Independent Studies (1-3 Credits)
Provides the student with the opportunity to pursue independent, interdisciplinary research and reading in specific areas of American culture studies.
Restriction: Permission of ARHU-American Studies department; and must be in American Studies program.
Repeatable to: 6 credits if content differs.

ANSC - Animal Science

ANSC101 Principles of Animal Science (3 Credits)
A comprehensive overview of the application of biology in the care and use of animals that live in close association with humans including food animals, companion animals, lab animals, zoo animals, etc. The role of science in modern food production using animals will be emphasized.

ANSC103 Principles of Animal Science Laboratory (1 Credit)
Laboratory focusing on the application of biology in the care and use of animals that live in close association with humans including livestock and companion animals. Labs will include live animals.
Prerequisite: Must have completed or be concurrently enrolled in ANSC101.
Restriction: Must be in one of the following programs (Environmental Sci & Pol-Environment & Agriculture; Agricultural and Veterinary Medicine; Agricultural Science and Technology) ; or must be in a major within the AGNR-Animal & Avian Sciences department; or permission of department required for students in other College of AGNR programs.

ANSC105 Horse Care Practicum (1 Credit)
This practicum course provides the opportunity for students to be involved in the routine care of the horses housed at the Campus Farm including grooming, feeding, turnout, first aid, record-keeping, and cleaning. Practical skills are supplemented with online learning.
Restriction: Permission of the instructor.
Credit Only Granted for: ANSC108 or ANSC105.
Formerly: ANSC108.

ANSC115 Careers in the Animal Sciences (1 Credit)
Discussion of current employment opportunities in Animal Science, primarily by invited speakers. In addition, students will have the opportunity to prepare resumes and improve oral presentation skills while working with their peers.
Prerequisite: ANSC101 and ANSC103.

ANSC120 Introduction to Dairy Judging (2 Credits)
Students will establish an understanding of dairy cattle anatomy and importance in dairy production, while gaining the ability to evaluate dairy cattle for soundness and show-ring appeal. Additionally, the class aims to provide students with confidence in justifying decisions of evaluation and gain confidence in public speaking.

ANSC121 Introduction to Livestock Judging (2 Credits)
Students will establish a working understanding of the structural anatomy of several livestock species- cattle, sheep, pigs, goats- and their individual importance in the Agricultural Industry, while gaining the ability to evaluate these species for soundness and show-ring appeal. Additionally, the class aims to provide students with confidence in justifying decisions of based on their evaluations and gain skills in public speaking. The course will include two weekend field trips to farms in order to practice judging skills.

ANSC201 Anatomy and Physiology of Domestic Animals (4 Credits)
The anatomy and physiology of domesticated animals with emphasis on functions related to homeostasis. Students will be developing an ability to think about material in processes. They will also gain experience in scientific writing and data analysis.
Prerequisite: ANSC101, ANSC103, BSCI170, and BSCI171.

ANSC204 Anatomy of Domestic Animals (2 Credits)
Covering the anatomy of major species of domestic animals. Utilizes a systemic approach to provide a general knowledge of both gross and microscopic mammalian structure. Comparative differences between the major domestic species are covered.
Prerequisite: ANSC101, ANSC103, BSCI170 and BSCI171.
Corequisite: ANSC205.
Restriction: Must be in one of the following programs (Environmental Sci&Pol-Wildlife Resources & Cons; Animal Sciences: Animal Care & Management; Animal Sciences: Equine Studies; Animal Sciences: Laboratory Animal Care; Animal Sciences: Sciences/Preprofessional; Animal Sciences: Animal Biotechnology; Agricultural and Veterinary Medicine).
Credit Only Granted for: ANSC211 or ANSC204 AND ANSC205.
Formerly: ANSC211.

ANSC205 Anatomy of Domestic Animals Laboratory (2 Credits)
A regional approach is taken to study the gross anatomy of major domestic species in the laboratory portion of this course.
Prerequisite: ANSC101, ANSC103, BSCI170 and BSCI171.
Corequisite: ANSC204.
Restriction: Must be in one of the following programs (Environmental Sci&Pol-Wildlife Resources & Cons; Animal Sciences: Animal Care & Management; Animal Sciences: Equine Studies; Animal Sciences: Laboratory Animal Care; Animal Sciences: Sciences/Preprofessional; Animal Sciences: Animal Biotechnology; Agricultural and Veterinary Medicine).
Credit Only Granted for: ANSC211 or ANSC204 and ANSC205.
Formerly: ANSC211.

ANSC210 Veterinary Terminology (1 Credit)
Students will learn terminology related to the clinical practice of small and large animal medicine including medical record terminology and a systems-based consideration of common practices and pathologies.
Prerequisite: ANSC204 and ANSC205; or ANSC201.
Restriction: Must be a major in Animal Sciences.
Additional Information: The course is offered on-line through a series of self-paced modules on ELMS.

ANSC212 Applied Animal Physiology (3 Credits)
The physiology of domesticated animals with emphasis on functions related to homeostasis, and the physiological adaptation to environmental influences.
Prerequisite: ANSC211; or (ANSC204 and ANSC205); or students who have taken courses with comparable content may contact the department.

ANSC214 Applied Animal Physiology Laboratory (1 Credit)
Application of physiological laboratory techniques to domestic and lab animals.
Prerequisite: Must have completed or be concurrently enrolled in ANSC212.

ANSC220 Livestock Management (3 Credits)
Management of meat animals including beef, sheep, and swine. This course will emphasize obtaining optimal efficiency of production through the integration of leading edge breeding, feeding, management, and marketing practices.
Prerequisite: ANSC101 and ANSC103.

ANSC226 The Future of Animal Agriculture (3 Credits)
Offers students the opportunity to learn about the history of animal agriculture in the United States and envision what its future might be as it adapts to major challenges such as our growing global population, climate change, food injustice, antimicrobial and insecticide resistance, animal welfare concerns, and farmer distress. The course will examine technological & biotechnological, agroecological, and social innovations that address these issues while providing healthy, safe, nutritious food. Students are invited to learn about these issues and to create and propose their own solutions through weekly "extend your learning" opportunities and a course project in animal agricultural extension.
Additional Information: The course is hosted on ELMS-Canvas and will require students to have reliable access to the internet.

ANSC227 Eating with Eyes Wide Open (3 Credits)
Are our diet and agricultural production methods sustainable? Students will investigate tensions created by trade-offs made by consumers relative to dietary choices which, in turn, can influence agricultural production methods. The course will inform students about their food supply so they can make informed dietary decisions and practice intentional/informed eating.

ANSC232 Horse Management (3 Credits)
An introductory course on the care, management, and use of horses. Major topics include the industry, breeds, conformation, feeding, health, reproduction, facilities and business.
Prerequisite: ANSC101 and ANSC103.
Credit Only Granted for: ANSC232 or ANSC332.
Formerly: ANSC332.

ANSC237 Equine Reproductive Management (3 Credits)
Students learn the fundamental skills necessary to manage an equine breeding herd including anatomy/physiology of genital tracts, estrus detection, manipulation of the estrous cycle, semen collection, pre- and post-foaling techniques, infertility, and health and nutrition of the mare, foal and stallion. Students will be required to spend ~ 30 hours during the spring semester caring for broodmares and foals and attending at least one foaling and estrous detection checks on broodmares outside of regularly scheduled class time.
Prerequisite: ANSC232.
Credit Only Granted for: ANSC237 or INAG233.
Additional Information: Course participation will include nightly checks of mares in the two weeks prior to parturition, and out-of-class time imprinting and working with newborn foals.

ANSC242 Dairy Cattle Management (3 Credits)
All aspects of dairy production, including nutrition, reproduction, mastitis control, milking management, farmstead facilities, financial management and forage production.
Prerequisite: ANSC101 and ANSC103.
Formerly: ANSC240 and ANSC241.

ANSC245 Sheep Management (3 Credits)
Popularly known as "Lamb Watch", this course provides an immersion environment for learning and understanding pre- and post-natal care of ewes and lambs through direct, hands-on involvement in the birthing process and care of the neonate through weaning on the campus farm. Course topics include zoonoses, basic reproductive physiology of the sheep, normal and abnormal parturition, management of lambs, qualitative assessment, breeding principles, nutrition, products and their marketing, and ram management.
Prerequisite: Minimum grade of C- in ANSC101 and ANSC103.
Restriction: Must be in one of the following programs (Animal Sciences: Animal Care & Management; Animal Sciences: Equine Studies; Animal Sciences: Laboratory Animal Care; Animal Sciences: Sciences/ Preprofessional; Animal Sciences: Animal Biotechnology; Agricultural and Veterinary Medicine).
Credit Only Granted for: ANSC235 or ANSC245.

ANSC246 Beef Management (3 Credits)
Provides an interactive environment for learning and understanding all areas of beef cattle management including hands-on involvement in the birthing process and care of newborn calves on the campus farm. Course topics will include: An introduction to Beef Production, Breeding and Selection, Reproduction, Nutrition, Cattle Health and Diseases, Cattle Behavior, facility design and management, and Careers working in the American Beef industry.
Prerequisite: ANSC101 and ANSC103.
Additional Information: Students will participate in night watches at the campus farm.

ANSC250 Companion Animal Care and Management (3 Credits)
Care and management of the companion small animals. Species covered include the cat, dog, rodents, lagomorphs, reptiles, amphibians, birds and others as class interest and schedule dictate. Basic description, evolutionary development, breeding, nutritional and environmental requirements, and public health aspects will be presented for each species.
Credit Only Granted for: ANSC250 and ANSC305.
Formerly: ANSC305.

ANSC252 Introduction to the Diseases of Wildlife (3 Credits)
The principal diseases of North American wildlife will be briefly considered. For each disease, specific attention will be given to the following: signs evidenced by the affected animal or bird, causative agent, means of transmission and effects of the disease on the population of the species involved.
Prerequisite: BSCI105; or (BSCI170 and BSCI171); or permission of AGNR-Animal & Avian Sciences department; or students who have taken courses with comparable content may contact the department.

ANSC255 Introduction to Aquaculture (3 Credits)
Introduces the art and science of rearing aquatic animals and the essential principles of aquaculture. Students receive hands-on training in the methods required for successful husbandry and management of aquatic animals in their water environment.
Prerequisite: ANSC101 and ANSC103; or must have completed an introductory biology course.

ANSC260 Laboratory Animal Management (3 Credits)
A comprehensive course in care and management of laboratory animals. Topics covered include regulations governing the use of animals in research, laboratory animal facility design and management, animal research models, animal health management and husbandry, responsibilities of lab animal workers and career opportunities in the field. Hands-on labs focus on lab animal handling, husbandry and common techniques. Field trips are required, and you must attend a minimum number of field trips which will be held during lab time.
Prerequisite: ANSC101 and ANSC103.
Credit Only Granted for: ANSC260 or ANSC413.
Formerly: ANSC413.

ANSC262 Commercial Poultry Management (3 Credits)
Theory and science of rearing poultry and marketing poultry meat and eggs in the commercial sector. Includes current issues, organization of the industry, as well as fundamental biology of the domestic chicken. Students will help raise a flock of broiler chickens. Field trips to commercial poultry operations are required.
Prerequisite: ANSC101 and ANSC103.

ANSC270 Animal Enterprise Management (3 Credits)
General principles of enterprise organization, management, and operation as applicable to food, livestock, and companion animals. Enterprise planning and establishment, management of financial, human, and animal resources, and other related topics will be investigated.
Prerequisite: ANSC101 and ANSC103; or permission of instructor.
Credit Only Granted for: ANSC270 or AREC306.

ANSC282 Grazing Animal Management (3 Credits)
For students interested in acquiring knowledge and skills in pasture management, grazing management of livestock (large and small ruminants, horses), and hay production. Fundamental information regarding best management practices for soils, plants, and grazing livestock will be covered
Prerequisite: ANSC101 and ANSC103; or permission of instructor.
Credit Only Granted for: ANSC110, ANSC282, or INAG116.
Formerly: ANSC110.

ANSC314 Comparative Animal Nutrition (3 Credits)
The fundamental role and implications of dietary preference, gastrointestinal physiology and nutrients in animal nutrition. Biochemical roles of nutrients in metabolism, digestion, absorption and assimilation as it relates to various life processes.
Prerequisite: ANSC101 and ANSC103; and (CHEM231, PLSC275 or AGST275).

ANSC315 Applied Animal Nutrition (3 Credits)
Elements of nutrition, source characteristics and adaptability of various feedstuffs to several classes of livestock. A study of the composition of feeds, nutrient requirements and computerized formulation of economic diets and rations for livestock.
Prerequisite: ANSC314.

ANSC327 Molecular and Quantitative Animal Genetics (3 Credits)
Classical, molecular, and population genetics with specific emphasis on animal systems will be covered. Also, disseminate information on molecular approaches for manipulating genetics at the whole animal level (transgenic and cloning). Other model organisms will be discussed to provide a conceptual framework.
Prerequisite: ANSC101, CHEM131, and BSCI170.

ANSC330 Equine Science (3 Credits)
Students will explore key principles of equine anatomy, physiology, exercise, genetics, nutrition, and health management. Emphasis is placed on recognizing, managing, and preventing common equine disorders, providing students with the skills to address challenges faced by horse owners and farm managers. Through case studies and practical applications, students will develop a comprehensive understanding of maintaining equine well-being and optimizing performance.
Prerequisite: ANSC232; or permission of instructor.
Recommended: ANSC212 and ANSC214; or ANSC201.
Credit Only Granted for: ANSC230 or ANSC330.
Formerly: ANSC230.

ANSC340 Health Management of Animal Populations (3 Credits)
A study of common and emerging animal infectious diseases and their prevention and control. The main focus will be on diseases of livestock, poultry, and companion animals; however, zoonotic, wildlife, and laboratory animal diseases will also be discussed along with biosecurity measures.
Prerequisite: BSCI223; and (ANSC220, ANSC232, ANSC242, ANSC250, ANSC255, ANSC260, or ANSC262).
Recommended: ANSC212 or ANSC201.

ANSC359 Internship Experience in Animal and Avian Sciences (3-6 Credits)
Experiential learning is a key component in an animal science education. Through the internship program, you will have the opportunity to develop your expertise in a specific species and discipline within the animal science curriculum. You will arrange an on- or off-campus internship experience related to animal science. You will spend a specified number of hours at the internship site each week and attend biweekly classroom sessions where we will discuss how the study of animal science fits into your specific internship experience as well as understand how to achieve each of the course learning outcomes.
Prerequisite: ANSC220, ANSC232, ANSC237, ANSC242, ANSC245, ANSC246, ANSC250, ANSC262, or ANSC282.
Restriction: Must be in a major within the AGNR-Animal & Avian Sciences department; and permission of instructor.
Repeatable to: 6 credits if content differs.
Additional Information: Students are required to submit an application to the Animal Science Internship Coordinator to enroll in this course.

ANSC371 Sustainable Agriculture and Environment: Global Seminar (1 Credit)
Students will learn how developing countries are building their agricultural economies to address multiple goals including reducing poverty, improving food security, as well as decreasing impacts from climate change and decreasing greenhouse gas emissions. The historical, political and social context will be discussed, and perspectives will be provided from representatives from diverse groups including farm workers, farm owners, women, and indigenous peoples. We will discuss examples of sustainable agroecology and incentives and impediments to their implementation.
Additional Information: This course is a prerequisite and companion to an optional winter-term study abroad course, ANSC372. Together these courses provide 3 General Education credits for Scholarship in Practice (DSSP) and Diversity: Cultural Competence (DVCC), and an elective for the Sustainability Minor.

ANSC372 Sustainable Agriculture and Environment: Study Abroad (2 Credits)
A short-term study abroad course on agriculture in developing countries. Travel destination will vary from year to year among member countries with campuses of the Latin American Institute of Agroecology, and member organizations in the international farm organization, La Via Campesina. Travel will include farm visits, women's cooperatives, and cultural organizations. Students will focus on poverty reduction, food security, and climate change, and the historical, political, and social context. A research paper is required based on interviews.
Prerequisite: ANSC371.
Additional Information: This course and the prerequisite (ANSC371) together provide 3 General Education credits for Scholarship in Practice (DSSP) and Diversity: Cultural Competence (DVCC), and an elective for the Sustainability Minor.

ANSC379 Animal Science Undergraduate Teaching Assistant Seminar (2 Credits)
Seminar course for undergraduate teaching assistants within ANSC.
Prerequisite: Permission of instructor.
Repeatable to: 8 credits.
Formerly: ANSC390.

ANSC386 Experiential Learning (3-6 Credits)
Prerequisite: Permission of AGNR-Animal & Avian Sciences department.
Restriction: Junior standing or higher.

ANSC388 Honors Thesis Research (3-6 Credits)
Undergraduate honors thesis research conducted under the direction of an AGNR faculty member in partial fulfillment of the requirements of the College of AGNR Honors Program. The thesis will be defended to a faculty committee.
Restriction: Must be in the AGNR Honors program.
Repeatable to: 6 credits if content differs.

ANSC389 Experiential Learning (3-6 Credits)
Prerequisite: Permission of AGNR-Animal & Avian Sciences department.
Restriction: Junior standing or higher.
Repeatable to: 6 credits if content differs.
Formerly: ANSC386.

ANSC398 Seminar - Research (1 Credit)
Presentation and discussion of current literature and research work in animal science.
Prerequisite: ANSC101 and ANSC103.
Repeatable to: 2 credits if content differs.

ANSC399 Special Problems in Animal Science (1-2 Credits)
Work assignments are designed to be proportional to the amount of credit. Students are expected to develop an abstract, fact sheet, manuscript, oral presentation, poster, webpage, journal-log, or other scholarly product associated with their study and/or project.
Prerequisite: ANSC101 and ANSC103.
Restriction: Permission of AGNR-Animal & Avian Sciences department; and junior standing or higher.
Repeatable to: 6 credits if content differs.

ANSC401 Animal Growth and Development for Production Agriculture (3 Credits)
An integration of the physiological, genetic, and nutritional bases of animal growth, development, and body composition with application to livestock production.
Prerequisite: ANSC201.

ANSC410 The Gut Microbiome and its Roles in Health and Disease (3 Credits)
A comprehensive study of the gut microbiome and its role in nutrition, metabolism, immunity, and disease prevention, with applications to farm animal health, food value, and human gastrointestinal health.
Prerequisite: 1 course from (BSCI223, ANSC201, ANSC212, ANSC327, EPIB301, BSCI222, BSCI421, NFSC430); or students who have taken courses with comparable content may contact the department.

ANSC417 Regulatory Issues in Animal Care and Management (3 Credits)
A study of regulatory issues affecting animal care and management in the livestock industry. Guest speakers and classroom discussions will focus on key topics including animal welfare, feed and drug regulations, animal identification, CAFO management, processing and marketing of animal products.
Prerequisite: ANSC220, ANSC232, ANSC242, ANSC250, ANSC255, ANSC260, ANSC262, or ANSC282; or permission of instructor.
Additional Information: Field trips may be required for this course.

ANSC435 Experimental Embryology (3 Credits)
Experimental approaches in animal embryology with emphasis on domestic livestock systems as applied to research and production systems. Lab will include hands-on experiments and demonstrations of techniques that are commonly used in industry and research.
Prerequisite: ANSC212 or ANSC201.
Recommended: ANSC446.
Credit Only Granted for: ANSC435 or ANSC489M.
Formerly: ANSC489M.

ANSC436 Animal Health Policy and Communication (3 Credits)
Intended for upper level students in Veterinary Medicine or Animal Science as well as other students who are interested in understanding how science and politics interact and influence animal health policy and how veterinarians and animal scientists can effectively communicate science to non-scientists such as legislators and policymakers.
Recommended: Completion of ANSC225 and ANSC340 recommend.
Cross-listed with: VMSC436.
Restriction: Must be in a major within the AGNR-Animal & Avian Sciences department; or permission of AGNR-VA-MD Regional COL Veterinary Med.
Credit Only Granted for: ANSC489A, ANSC436, or VMSC436.
Formerly: ANSC489A.

ANSC437 Animal Biotechnology (3 Credits)
Key concepts and current issues in animal biotechnology are covered. Current techniques and applications systems as well as social, ethical, and regulatory issues associated with biotechnology will be discussed.
Prerequisite: ANSC327; or students who have taken courses with comparable content may contact the department.

ANSC440 Zoonotic Diseases and Control (3 Credits)
Examines zoonotic diseases of importance in the United States and worldwide, with an emphasis on those originating from farm animals as well as those transmitted by vectors such as rodents and arthropods. Topics include major foodborne and vector-borne zoonoses, principles of transmission and control, human risk factors, and surveillance methods. Students will also explore the historical and emerging significance of zoonotic diseases, approaches to vector management, alternatives to pesticide use, and relevant regulations and safety measures.
Prerequisite: 1 course from (BSCI223, ANSC201, ANSC212, ANSC327, BSCI222, BSCI421, NFSC430); or students who have taken courses with comparable content may contact the department.

ANSC443 Physiology of Lactation (3 Credits)
A comprehensive survey of lactation in laboratory and domestic animals. Other species are discussed where possible. Emphasis will be placed on physiological aspects of milk synthesis and secretion and on the cellular and molecular biology of mammary gland development.
Prerequisite: ANSC212; and (CHEM231, PLSC275 or AGST275).
Recommended: BCHM463.

ANSC444 Domestic Animal Endocrinology (3 Credits)
A comprehensive course covering the major endocrine systems in domestic animals. Topics include each of the major endocrine axes, hormonal regulation of homeostasis, growth and reproduction, molecular endocrinology and endocrine mechanisms of action.
Prerequisite: ANSC212 or ANSC201.
Restriction: Must not have completed ANSC644.
Credit Only Granted for: ANSC444 or ANSC644.

ANSC445 Comparative Gut Physiology & Diseases (3 Credits)
Explores the anatomy, histology, and physiology of the gastrointestinal (GI) system in humans and animals, including dogs, pigs, horses, cattle, and birds. Students will study how gut function supports health and development, and how it becomes disrupted in common and emerging diseases. The course also explores the gut's functions beyond the GI tract, including its roles in the gut-liver and gut-brain axes, while reviewing important research on gastrointestinal disorders. It prepares students for careers in veterinary and human medicine, industry, and scientific research.
Prerequisite: ANSC212 or ANSC201.

ANSC446 Physiology of Mammalian Reproduction (3 Credits)
Provides an in-depth examination of reproductive anatomy and physiology in domesticated livestock species, emphasizing the biological mechanisms and management strategies that influence reproductive efficiency. Students will explore the endocrine regulation of reproduction, assisted reproductive technologies, and factors affecting fertility, pregnancy, parturition, and lactation. The course integrates scientific principles with practical applications in animal agriculture, preparing students to evaluate and apply reproductive management techniques in livestock production systems.
Prerequisite: ANSC212, ANSC201 or BSCI440.

ANSC447 Physiology of Mammalian Reproduction Laboratory (1 Credit)
Gross and micro-anatomy, artificial insemination, estrous cycle synchronization and invitro-fertilization procedures and analytical techniques useful in animal management and reproduction.
Prerequisite: Must have completed or be concurrently enrolled in ANSC446.

ANSC450 Animal Breeding Plans (3 Credits)
Design of animal breeding programs for the genetic improvement of livestock and companion animal species. Principles of population and quantitative genetics. Genetic evaluations of animals, selection strategies and crossbreeding systems. Incorporation of statistics and biotechnology into animal breeding plans.
Prerequisite: ANSC101; and 1 course with a minimum grade of C- from (MATH120, MATH136, MATH140, or BIOM301).
Restriction: Junior standing or higher.

ANSC452 Avian Physiology (3 Credits)
Provides a comparative study of avian and mammalian physiology, with emphasis on similarities and differences across systems. Students will analyze the reproductive, digestive, renal, respiratory, circulatory, immune, endocrine, and nervous systems of birds, as well as physiological adaptations unique to avian species such as flight and migration.
Prerequisite: ANSC201 or ANSC212.
Restriction: Junior standing or higher.

ANSC453 Animal Welfare and Bioethics (3 Credits)
Ethical concerns related to the use of animals in modern society. Historical and philosophical overview of animal welfare and bioethics. Applied ethical discussions on human/animal interrelationships, physical and genetic manipulation, and other current issues associated with the treatment of animals used in food production, research, zoos, and as pets.
Prerequisite: ANSC101 and ANSC103; or BSCI106; or (BSCI160 and BSCI161); or permission of instructor.
Restriction: Junior standing or higher.

ANSC454 Nutritional Aspects of Metabolic Disease (3 Credits)
Biochemical and physiological fundamentals of nutrition. Discussion of protein, fat,carbohydrate, minerals and vitamins and their roles and interrelationships innutrition, metabolism and diseases in humans and animals. The course will use recommended texts for foundation material as well as research papers to provide in-depth coverage and illustrate emerging themes in metabolic aspects of nutrition and disease.
Prerequisite: CHEM131 and ANSC101, or BSCI170; or students who have taken courses with comparable content may contact the department.
Credit Only Granted for: ANSC4890 or ANSC454.
Formerly: ANSC489O.

ANSC455 Applied Animal Behavior (3 Credits)
Principles of animal behavior applied to production systems in animal agriculture.
Prerequisite: ANSC101 and ANSC103; or BSCI106; or (BSCI160 and BSCI161).

ANSC460 Comparative Vertebrate Immunology (3 Credits)
Basic concepts in immunology, and comparing immunity in different vertebrates, including organization of immune systems, innate and adaptive immune responses. Special attention will be paid to how cell-mediated and humoral immune responses are induced in natural infections, and what are the effector mechanisms in both of these processes. Immune response in representative disease models such as infections with viruses and bacteria, cancer, and autoimmune disease will be discussed. Lectures concerning cutting-edge research will also be given.
Prerequisite: ANSC212, ANSC201, BSCI201, or BSCI440.

ANSC489 Current Topics in Animal Science (1-3 Credits)
Examination of current developments in the animal sciences.
Repeatable to: 6 credits if content differs.

ANSC497 Animal Biotechnology Recombinant DNA Laboratory (3 Credits)
An advanced course offering hands-on experience in performing recombinant DNA experiments. Current molecular biology techniques used for cloning genes, analyzing the gene products, and modifying the genes of animals will be performed. Techniques include isolation of DNA, use of restriction enzymes; cloning procedures, PCR analysis, and Southern hybridizations. Lecture material focuses on interpretation of results generated in the laboratory.
Prerequisite: ANSC327; or students who have taken courses with comparable content may contact the department.
Recommended: ANSC437 and ANSC435.

ANTH - Anthropology

ANTH138 Special Topics in Study Abroad I (1-6 Credits)
Special topics course taken as part of an approved study abroad program.
Repeatable to: 15 credits if content differs.

ANTH210 Introduction to Medical Anthropology and Global Health (3 Credits)
An introduction to the central concepts in medical anthropology and the anthropology of global health. This course is a survey of anthropological notions of health, disease, and the body in cross-cultural and global contexts, including classic and contemporary texts. It will provide an examination of systems of knowledge and practice with regard to illness, healing, and global health inequities.

ANTH221 Introduction to Forensic Sciences (3 Credits)
Provides a brief history of forensic sciences, an introduction to some of the techniques used, and a demonstration of some of the applications of forensic sciences. A survey course designed to give the student some exposure to the kinds of scientific knowledge and techniques applied to the medico-legal investigation of death and other crimes.
Credit Only Granted for: ANTH298A or ANTH221.
Formerly: ANTH298A.

ANTH222 Introduction to Ecological and Evolutionary Anthropology (4 Credits)
An introduction to the evolution of human physiology and human behavior, the relationship between hominid and non-hominid primates, and the study of relationships between a population of humans and their biophysical environment.
Credit Only Granted for: ANTH220 or ANTH222.

ANTH238 Special Topics Study Abroad II (1-6 Credits)
Special topics course taken as part of an approved study abroad program.
Repeatable to: 15 credits if content differs.

ANTH240 Introduction to Archaeology (3 Credits)
Exploration of the variety of past human societies and cultures through archaeology, from the emergence of anatomically modern humans to the more recent historical past.

ANTH242 Fire, Farming and Climate Change: An Archaeology Take on the History of Human Impacts on our Planet (3 Credits)
An examination of why climate changes, the methods for recording climate change, and case studies of the varied responses of past human societies to climate change in different geographic regions and time periods with varying socio-political and economic systems.

ANTH260 Introduction to Sociocultural Anthropology and Linguistics (3 Credits)
Culture and social relationships in a wide variety of settings from small-scale to complex societies. An overview of how anthropology analyzes human behavior. Particular attention to the relationship between language and culture.

ANTH263 Sexuality and Culture (3 Credits)
An overview of sexuality from an anthropological perspective, looking at aspects of sexuality within our own culture and in cultures around the world. Course topics include the biology and culture of sex, gender, physical attraction, sexual orientation, marriage and mating taboos, fertility control, sexually transmitted diseases, and commercial aspects of sex.
Credit Only Granted for: ANTH298K or ANTH263.
Formerly: ANTH298K.

ANTH264 Immigration Policy, Immigrant Lives (3 Credits)
An examination of the phenomenon of international migration, or immigration. Students develop awareness of how immigration has been framed in the general public and examined by social science disciplines, most prominently anthropology. Examination of case studies of different immigrant groups in distinct geographic contexts will illuminate the varied incorporation experiences of immigrants into U.S. society.
Cross-listed with: IMMR219C.
Credit Only Granted for: ANTH264 or IMMR219C.

ANTH265 Anthropology of Global Health (3 Credits)
An overview of the growing field of global health including health care systems, medical practices, ideas about illness in cross-cultural contexts, issues of health development, global health inequity, and human rights issues. The course will focus on the history of global health, the critique of major international health agencies and their development paradigms, and the political economy of social inequalities and health.

ANTH266 Changing Climate, Changing Cultures (3 Credits)
Explore past, present, and future interactions between humans and climate. Discussions, methods-oriented activities, and case study analyses provide students a foundation for appreciating the role of anthropology in understanding, responding to, and preparing for climate change.

ANTH267 Organic, Mechanical, Digital (3 Credits)
Beginning in the middle to late 20th century, human organization and experience has increasingly been influenced by digital forms of communication and production. Do these changes make us new types of people and societies? By putting the digital world in the context of the major periods associated with organic and mechanical technology, this course examines who contemporary people are and whether or not they are unique. The answer to this question will focus on how technological changes the individual, social organization and the relationship with the natural world. Sources from historians, anthropologists, sociologists, philosophers, political scientists and ecologists will be used to reconstruct these worlds.

ANTH298 Special Topics in Anthropology (3 Credits)
Anthropological perspectives on selected topics of broad general interest.
Repeatable to: 6 credits if content differs.

ANTH299 Student Initiated Course (1-3 Credits)
Student Initiated Course (STIC) in Anthropology. Course is student initiated and taught under close supervision of a faculty mentor.
Repeatable to: 6 credits if content differs.
Additional Information: ANTH299 will serve as a "special topics" kind of number for any Student Initiated Courses (STIC) offered in Anthropology. So far, we have only offered one ANTH299A, sample syllabus attached.

ANTH305 Archaeological Methods and Practice (3 Credits)
A team-taught, interdisciplinary course discussing theories, methods, and ethical issues in the practice of archaeology.
Prerequisite: ANTH240, ARTH200, CLAS180, or CLAS190.
Cross-listed with: ARTH305, CLAS305, JWST319Y.
Credit Only Granted for: ANTH305, ARTH305, CLAS305, or JWST319Y.

ANTH310 Method & Theory in Medical Anthropology and Global Health (3 Credits)
Provides a critical perspective to global health that encompasses key political, economic, and cultural factors associated with the nature and magnitude of global health issues such as HIV/AIDS, tuberculosis and malaria, paying particular attention to how poverty and inequalities within and between societies has accelerated current global health challenges. Introduces students to how medical anthropologists have contributed to the debates surrounding the globalization of health.
Prerequisite: ANTH210. Jointly offered with ANTH665.
Credit Only Granted for: ANTH310, ANTH465, or ANTH665.
Formerly: ANTH465.

ANTH322 Method and Theory in Ecological Anthropology (3 Credits)
A theoretical consideration of ecological anthropology, focusing on issues related to cooperation, the management of common property, resilience, and sustainability. Explores the methods of sociocultural anthropology, including ethnology, evolutionary game theory and agent-based modeling; and natural-science approaches including behavioral and systems ecology.
Prerequisite: ANTH220 or ANTH222.
Restriction: Must be in a major within the BSOS-Anthropology department.
Credit Only Granted for: ANTH320, ANTH322, ANTH425, or ANTH625.

ANTH323 Plagues, Pathogens and Public Policy (3 Credits)
The impact of diseases on populations from prehistoric times through the present will be examined, along with public perceptions of disease, scientific breakthroughs on treatment and prevention, and the ways that politics and public health policies can enhance or impede the advancement of disease treatment. The natural history of disease, population structure, and immunity will be discussed. The class will address emerging and re-emerging diseases and the ways that first responders, researchers, and policy makers may affect the outcome of an outbreak.
Credit Only Granted for: ANTH429A or ANTH323.
Formerly: ANTH429A.

ANTH338 Special Topics in Study Abroad III (1-6 Credits)
Special topics course taken as part of an approved study abroad program.
Repeatable to: 15 credits if content differs.

ANTH340 Method and Theory in Archaeology (3 Credits)
Theory, method, and practice which guides modern anthropological archaeology. Includes research design and execution (from survey through excavation and interpretation), the reconstruction of aspects of past cultures, and the understanding of cultural change and meaning.
Prerequisite: ANTH240.
Restriction: Must be in Anthropology program; or permission of BSOS-Anthropology department.

ANTH341 Introduction to Zooarchaeology (3 Credits)
Zooarchaeology is the study of animal remains, especially bones, from archaeological contexts. This course will address both methodology as well as many of the main issues in contemporary zooarchaeology. Zooarchaeology stands at the intersection of a number of social and biological sciences, such as Biology, Osteology, Ecology, History, Anthropology and Economics. We will discuss basic animal osteology and the concepts and practices behind the identification of animal remains from archaeological contexts. We will cover the nature of the data in zooarchaeology, especially issues around using proxy data.
Credit Only Granted for: ANTH298D, ANTH641 or ANTH341.
Formerly: ANTH298D.

ANTH345 Introduction to Laboratory Methods in Archaeology (3 Credits)
The processing, curation, cataloging and analysis of data is an important part of any archaeology field project. Students will learn the basics of laboratory techniques necessary for the final analysis and interpretation of field data.

ANTH357 Approaches to Sustainable Development (3 Credits)
An overview of the history of sustainable development, major development and environmental theories, and development strategies as they relate to an anthropological concern for an integrated, holistic, comparative, and humane approach to sustainable development.
Jointly offered with: ANTH657.
Credit Only Granted for: ANTH357 or ANTH657.

ANTH358 Undergraduate Teaching Assistant (1-3 Credits)
Individual instruction course: contact department or instructor to obtain section and index numbers.
Prerequisite: ANTH220, ANTH260, or ANTH240.
Restriction: Junior standing or higher; and must be in Anthropology program.
Repeatable to: 6 credits if content differs.

ANTH360 Method and Theory in Sociocultural Anthropology (3 Credits)
Theoretical approaches and research methods in sociocultural anthropology. Emphasis on current debates, new directions, and their historical antecedents.
Prerequisite: ANTH260.
Restriction: Must be in Anthropology program; or permission of BSOS-Anthropology department.

ANTH368 Regional Ethnography (3 Credits)
Peoples and cultures of a particular region of the world, on the basis of ethnographies, archaeological evidence, and relevant works by social historians and political economists. The regional focus and thematic emphasis will vary by semester.
Prerequisite: ANTH260; or permission of BSOS-Anthropology department.
Repeatable to: 6 credits if content differs.

ANTH380 Culture and Discourse (3 Credits)
Contemporary discourse analysis and pragmatics applied to ethnographic research problems with particular attention to roots in recent linguistic anthropological work in ethnographic semantics and ethnography of speaking.

ANTH386 Experiential Learning (1-6 Credits)
Recommended: Completion of advanced courses in relevant subfield of anthropology recommended.
Restriction: Permission of BSOS-Anthropology department; and junior standing or higher; and must be in Anthropology program.

ANTH398 Independent Study (1-3 Credits)
Independent interdisciplinary research and reading in specific areas of anthropology.
Restriction: Permission of BSOS-Anthropology department.
Repeatable to: 9 credits if content differs.

ANTH403 Queer Anthropology (3 Credits)

ANTH407 Anthropology and Development (3 Credits)
An examination of the intersection of Anthropology, international development and foreign policy. The course provides students with conceptual tools to engage with international development and other assistance projects in areas including conservation and climate change, governance and human security, gender, human rights, and political stability from a variety of viewpoints.
Jointly offered with: ANTH607.
Credit Only Granted for: ANTH407 or ANTH607.

ANTH411 Global Migration and Health (3 Credits)
The United Nations estimates that some 230 million people around the world are migrants who live outside their country of birth. This course focuses on these migrant populations, considering the implications of movement across borders and settlement in new societies on their health and well-being. We will investigate the social, political, and economic structures that shape disease and illness and produce differential access to health care for migrants. Within that context, we will explore the health effects of migration itself and particular health conditions from which migrants suffer. We will also examine how migrants interface with differently configured health care systems as well as strategies they and their advocates use to promote health and well-being.
Jointly offered with: ANTH611.
Credit Only Granted for: ANTH411 or ANTH611.

ANTH412 Hypermarginality and Urban Health (3 Credits)
Using perspectives from medical and urban anthropology, we examine the phenomenon of hypermarginality--the clustering of extreme poverty, chronic disease, addiction, violence and trauma in certain social and spatial contexts, often urban. We will explore both the broader social, political, and economic structures of exclusion that produce hypermarginality, as well as the illness experiences associated with these conditions. As we consider both social suffering and the related institutional responses, we will also discuss the role of anthropological approaches in national discussions about health inequities.
Credit Only Granted for: ANTH412 or ANTH612.

ANTH413 Health Inequities, Care, and Justice in the United States (3 Credits)
Systematic health inequities in the United States are well documented, shaped by structural forces that determine who gets sick, what illnesses/diseases they are vulnerable to, what their care options are, how they are treated while seeking care, and their ultimate health outcomes. This course applies the concepts, methods, and theoretical approaches of medical anthropology to examine the roots and implications of these health inequities. Students will also assess efforts to address these inequities through tailored interventions and social movements organized around equity and justice.
Jointly offered with: ANTH613.
Credit Only Granted for: ANTH413 or ANTH613.

ANTH415 Critical Global Health (3 Credits)
Extends understandings of diverse health conditions facing world populations today and the science being made around them. Critically examines key issues in global aid and public health, with an emphasis on the theories, concepts, and methods of anthropology.
Recommended: ANTH210, ANTH310, or ANTH265 or a similar course focused on global health or medical anthropology course.
Jointly offered with: ANTH615.
Credit Only Granted for: ANTH415 or ANTH615.

ANTH416 Anthropology of Global Violence (3 Credits)
An examination of anthropological approaches to the study of violence, drawing from key texts to analyze how violence operates along a continuum: from routine, sometimes invisible forms of violence embedded in everyday life, to more overt and exceptional forms. Consideration of the role of ethnography in elucidating both the subjective experiences of violence and the ways in which violence is embedded in institutions, structures, and global political-economic processes. Analysis of the specific relationships between violence, health, mental health, and trauma in local and global contexts.Jointly offered with ANTH616.
Credit Only Granted for: ANTH468O, ANTH66 8O, ANTH416 or ANTH616.
Formerly: ANTH468O.

ANTH421 Nutritional Anthropology (3 Credits)
The study of nutrition from an anthropological perspective which includes both biological and cultural aspects of nutrition. We will explore how nutrition can affect culture how culture can affect nutrition. Nutritional anthropology includes the study of cross-cultural variation in diet, nutritional status and subsistence systems as well as variation in these factors over the evolutionary course of human existence, from prehistoric and historic to modem times. Students will be introduced to nutritional anthropology and provided with the basics for assessing reliability and feasibility of nutritional advice and policy encountered in everyday modern life in a global setting.
Credit Only Granted for: ANTH421, ANTH428N, or ANTH621.
Formerly: ANTH428N.

ANTH424 Human Skeletal Anatomy (3 Credits)
In addition to descriptive information about bone identification, the lectures will address the history of human anatomical studies, the development of analytical techniques, and the application of these techniques in paleoanthropology, comparative anatomy, functional anatomy (and related fields, such as physical therapy), and skeletal analysis in museum, historic cemetery, archaeological, and forensic settings. Emphasis will be on the development of the skeleton and recognition of normal variation in bones. The laboratory sessions will allow the students access to human bones for the purpose of identification, documentation of human variation, and application of techniques to obtain information about the living individual from the skeleton.

ANTH428 Special Topics in Bioanthropology (3 Credits)
Advanced research courses in biological anthropology on changing topics that correspond to new theoretical interests, faculty research interests, or the specialties of visiting scholars. Prerequisites or background knowledge vary with the topic. Check with the department for requirements.
Repeatable to: 6 credits if content differs.

ANTH429 Advanced Special Topics in Biological Anthropology (3 Credits)
Upper level biological anthropology courses on varying topics derived from new interests of the faculty or the specialties of visiting scholars.
Repeatable to: 6 credits if content differs.

ANTH433 Archaeology of Slavery: Classical, Caribbean and North American Contexts (3 Credits)
Has slavery always existed? Does it come and go? North American plantation archaeology has become one of the foundations for understanding African American culture from the 1960s. Slavery in Antiquity existed in Greece and Rome on large scales and was essential to making commercial agriculture profitable work. Slavery in the Caribbean showed Europeans how to make a profit from African bodies. Trafficking in human persons today is recorded by the U.S. State Department annually and is regarded as modern slavery. These varying contexts of slavery will be compared in an attempt to understand slavery scientifically.
Jointly offered with: ANTH633.
Credit Only Granted for: ANTH433 or ANTH633.

ANTH435 Archaeological Ethnography and Heritage Ethnography (3 Credits)
Archaeologists and other heritage experts are increasingly incorporating ethnographic approaches as part of their methodological toolkit. This course explores key methods and frameworks in archaeological ethnography and heritage ethnography, set within the broader contexts of the historical development of anthropological theory and the current rapid growth of heritage studies as an interdisciplinary field of research and practice.
Jointly offered with: ANTH635.
Credit Only Granted for: ANTH435 or ANTH635.

ANTH436 Norse Archaeology (3 Credits)
The archaeology of the Norse world from the 8th century through to the end of the 11th century. We will investigate the possible causes of the Norse expansion out of Scandinavia. The various settlements and colonies of Norse Russia, the Baltic, Britain, Ireland and the North Atlantic Islands (Orkney, the Shetlands, the Faroes, Iceland, Greenland and Newfoundland) will be examined. While we will look at the Norse in detail we will also attempt to put their raiding, trading, and settlements into a larger Eurasian context through a study of the archaeology of this period.
Credit Only Granted for: ANTH436 or ANTH636.

ANTH438 Special Topics in Study Abroad IV (1-6 Credits)
Special topics course taken as part of an approved study abroad program.
Repeatable to: 15 credits if content differs.

ANTH440 Theory and Practice of Historical Archaeology (3 Credits)
Historical archaeology enhances cultural heritage by providing voice for groups who were often unable to record their own histories, such as women, laborers, working class families, and enslaved people. The course provides insight into issues related to race, gender, and ethnicity as they relate to multicultural histories.
Prerequisite: ANTH240. Jointly offered with ANTH640.
Credit Only Granted for: ANTH440 or ANTH640.

ANTH441 Archaeology of Diaspora (3 Credits)
"Diaspora" is defined, theorized, deconstructed, and employed throughout the social sciences. There are context specific relations that define who leaves, when, and how they are received in the new place of settlement. Over the course of the semester the class will actively and critically examine the relevance of historical archaeology and material culture studies in the understanding of the formation, experiences, and transformation of diasporic groups over time and space.
Prerequisite: ANTH240.
Credit Only Granted for: ANTH448A, ANTH688Z, or ANTH441.
Formerly: ANTH448A.

ANTH445 Laboratory Methods in Archaeology (3 Credits)
The processing, curation, cataloging and analysis of data is an important part of any archaeology field project. Students will learn that basics of laboratory techniques necessary for the final analysis and interpretation of field data.
Prerequisite: ANTH496.
Recommended: ANTH240.

ANTH447 Material Culture Studies in Archaeology (3 Credits)
An in-depth introduction to the world of material culture studies with a focus on the methods and theories in historical archaeology. Students will look at archaeological data as historical documents, commodities and as symbols expressing ideas.
Prerequisite: ANTH240.
Credit Only Granted for: ANTH447, ANTH448C, ANTH647, or ANTH689C.
Formerly: ANTH448C.

ANTH448 Special Topics in Archaeology (3 Credits)
Advanced topics in archaeological research, corresponding to new theoretical developments, faculty research interests, or specialties of visiting scholars. Prerequisites may vary with course topic; check with the department for requirements.
Prerequisite: ANTH240.
Repeatable to: 6 credits if content differs.

ANTH449 Advanced Special Topics in Archaeology (3 Credits)
Upper level archaeology courses on varying topics derived from new interests of the faculty or the specialties of visiting scholars.
Repeatable to: 6 credits if content differs.

ANTH450 Theory and Practice of Environmental Anthropology (3 Credits)
An overview of contemporary application of cultural theory and methods to environmental problems. Topics include the use of theories of culture, cognitive approaches, discourse analysis, and political ecology. Case studies from anthropology, other social sciences, humanities, conservation, and environmental history are used to demonstrate the applied value of a cultural-environmental approach.
Restriction: Junior standing or higher. Jointly offered with ANTH650.
Credit Only Granted for: ANTH450 or ANTH650.

ANTH451 Environmental Archaeology (3 Credits)
An overview of modern environmental archaeology as a tool for the interdisciplinary investigation of past and present global change and to engage the long term past with current issues of sustainability and rapid environmental change.
Credit Only Granted for: ANTH451, ANTH651, ANTH448F, ANTH668F.
Formerly: ANTH448F.

ANTH452 Anthropology and Climate Change (3 Credits)
Human activities now influence ongoing global climatic change, and the outcome remains uncertain for communities and cultures around the world. This interaction between humans and climate provides a rich area of study for anthropologists in an interdisciplinary context. Case studies of historic and contemporary evidence will be used to understand impacts of global climate change and assess opportunities and barriers to successful responses and adaptation.
Prerequisite: ANTH220, ANTH222, ANTH240, or ANTH260.
Credit Only Granted for: ANTH452 or ANTH652.

ANTH453 Archaeology of the Modern City (3 Credits)
An overview of how social scientists, in particular historical archaeologists, approach modern cities as being part of the materiality of the social structure and order.
Prerequisite: ANTH240; or permission of instructor.
Credit Only Granted for: ANTH448Q or ANTH453.
Formerly: ANTH448Q.

ANTH454 Political Ecology (3 Credits)
The use of the environment is contested and negotiated within historic and contemporary societies. Incorporating methods and perspectives from across the social sciences through specific case studies in the Americas, Europe, Asia and Africa, this course offers a survey to coupled human-environmental systems.
Jointly offered with: ANTH654.
Credit Only Granted for: ANTH454 or ANTH654.

ANTH461 Language as Practice (3 Credits)
An introduction to linguistic variation and the construction of identity, relationship, and community membership through language use. The approach emphasizes language as community-based practice and examines the dynamic construction of social relations through linguistic interactions.
Jointly offered with: ANTH661.
Credit Only Granted for: ANTH461, ANTH468I or ANTH661.
Formerly: ANTH468I.

ANTH463 Climate Cultures (3 Credits)
Climate change is an inherently global problem. To a significant degree, its causes and consequences are cultural in nature: Climate change impacts, mitigation and adaptation efforts are perceived and addressed in culture-specific ways. This course will be an overview of the holistic and anthropological approaches to the study of how culture frames what we know and how we respond to climate change. Readings, lectures, and discussions will focus on how culture is expressed through the interplay of processes and practices in specific economic, social and political contexts.

ANTH464 Anthropology of Cultural Heritage (3 Credits)
A global exploration of how the past is remade in the present. Covers the breadth of scope and specific interventions of heritage practice at the global scale, including the social, political, economic, and ethical dimensions of cultural heritage.
Prerequisite: ANTH260. Jointly offered with ANTH664. Credit only grant ed for: ANTH469T, ANTH689T, ANTH464, ANTH664.
Formerly: ANTH469T.

ANTH465 Applied Ethnoecology (3 Credits)
Introduces theory and methodology for applied ethnoecology, the study of human relationships with and knowledge about the environment. Students will examine human relationships with both biotic (e.g. plants and animals) and abiotic (e.g. glaciers, weather) elements of ecological systems to better understand how knowledge frameworks and cultural practices shape human experiences of the natural world. The history of ethnoecology as a discipline will be covered, before moving to applied case studies where different ecological knowledge systems intersect as a result of conservation projects, bioprospecting, and other contemporary environmental issues. This course involves both discussion and project-based learning including StoryMaps, cultural domain analysis and text analysis.
Credit Only Granted for: ANTH465 or ANTH688E.

ANTH466 Anthropology of Work (3 Credits)
Examines the concept and meaning of work, the different types of work, and how the development of time discipline became essential for the creation of capitalist labor. Explores the contemporary social justice movement and its impact on gender and racialized inequities. Includes an exploration of deindustrialized regions in the Rust Belt.
Jointly offered with: ANTH666.
Credit Only Granted for: ANTH466 or ANTH666.

ANTH467 Researching Environment and Culture (3 Credits)
In this applied course, students use mixed methods to research a locally-based, environmental sustainability issue. Classroom time will be split between seminar discussions of theory, methods, and relevant case studies, and lab work focused on project development, data analysis, and report write up. Students are expected to spend additional time outside class on data collection, analysis, and writing
Recommended: ANTH322, ANTH360, ENSP101, or ENSP102.

ANTH468 Special Topics in Cultural Anthropology (3 Credits)
Advanced courses in varying specialty areas of cultural anthropology that respond to new theoretical developments, faculty research interests, or specialties of visiting scholars.
Repeatable to: 6 credits if content differs.

ANTH469 Advanced Special Topics in Cultural Anthropology (3 Credits)
Upper level cultural anthropology courses on varying topics derived from new interests of the faculty or the specialties of visiting scholars.
Repeatable to: 6 credits if content differs.

ANTH473 Native American Languages and Cultures (3 Credits)
An introduction to Native American Languages and Cultures from a linguistic anthropological perspective. Topics to be explored include Native American identities, the stucture of Native languages, oral traditions, narrative story-telling, Native language and thought (Sapir/Whorf), language shift, linguistic revitalization, documentation of endangered languages, indigenous representation and appropriation, and racializing discourses.
Jointly offered with: ANTH673.
Credit Only Granted for: ANTH473 or ANTH673.

ANTH474 Language Racism & Identity (3 Credits)
An exploration of the relationship between language, identity and racism in a variety of social contexts, in the U.S. and elsewhere.
Jointly offered with: ANTH674.
Credit Only Granted for: ANTH474, ANTH469R, ANTH674, or ANTH689R.

ANTH478 Special Topics in Linguistics (3 Credits)
Advanced courses in specialty areas that respond to new theoretical developments and faculty research interests in linguistics.
Recommended: LING200.
Repeatable to: 6 credits if content differs.

ANTH481 Environmental Ethnographies of Asia (3 Credits)
Examines social and ecological environments in Asia through the lens of classic and contemporary ethnographies from across the continent. Considers how cultural, political and economic dynamics interact with ecological systems in both recurring and unexpected ways. Ethnographies include case studies of global commodity chains, technoscientific management, borders and migration, conservation, and local knowledge as they intersect with changing environments.
Credit Only Granted for: ANTH481 or ANTH681.

ANTH485 Honors Research Preparation (3 Credits)
Honors Research Preparation is an independent study course during which the Honors candidate will work with their Honors Thesis Advisor to establish not only the structure of the thesis and timeline, but also the formation of Thesis Review Committee.
Restriction: Permission of BSOS-Anthropology department; and must be in Anthropology program; and must be admitted to University Honors Program or Anthropology Honors Program.

ANTH486 Honors Research (3-4 Credits)
Capstone course in which students pursue independent research into a current problem in anthropology, selected with assistance of a committee of faculty. Research leads to the writing of an honors thesis in anthropology.
Restriction: Permission of BSOS-Anthropology department; and must be in Anthropology program; and must be admitted to University Honors Program or Anthropology Honors Program.
Credit Only Granted for: ANTH486 or ANTH476.

ANTH487 Honors Thesis (3-4 Credits)
Capstone course in which students write a thesis on the results of independent research into a current problem in anthropology.
Prerequisite: ANTH486.
Restriction: Permission of BSOS-Anthropology department; and must be in Anthropology program; and must be admitted to University Honors Program or Anthropology Honors Program.
Credit Only Granted for: ANTH487 or ANTH477.

ANTH496 Field Methods in Archaeology (6 Credits)
Field training in the techniques of archaeological survey and excavation.

ANTH498 Advanced Field Training in Ethnography (1-8 Credits)
Experience in field research utilizing a variety of ethnographic methods of inquiry.
Repeatable to: 6 credits if content differs.
Credit Only Granted for: ANTH498 or ANTH698.

AOSC - Atmospheric and Oceanic Science

AOSC123 Causes and Consequences of Global Change (3 Credits)
Study of the major components of Earth's climate system and climate change history. Discussion of 21st century climate change prediction, mitigation and adaptation efforts.
Cross-listed with: GEOL123.
Credit Only Granted for: AOSC123, GEOG123, or GEOL123.

AOSC200 Weather and Climate (3 Credits)
What are weather and climate? Most people think they know but if you ask people to explain the differences and similarities you're bound to get a range of answers. Weather affects not just our daily activities but other important aspects of society such as transportation, commerce, security and agriculture. Most people understand what weather is to some extent. Climate and climate change are concepts that evoke strong emotional responses from people but are less well understood. In this class, students examine fundamental issues such as the greenhouse effect, severe weather, and global weather patterns and how they relate to a changing climate. Instruction in the lectures will provide the basic knowledge needed to understand these issues. In the discussion sections, students will be divided into groups to address the implications of these topics through group projects.
Prerequisite: MATH107, MATH110, or MATH115.
Recommended: Concurrent enrollment in AOSC201.

AOSC201 Weather and Climate Laboratory (1 Credit)
Laboratory exercises to supplement AOSC200, including weather observations, weather map analysis, forecasting practice and climate modeling.
Corequisite: AOSC200.

AOSC247 Scientific Programming: Python (3 Credits)
A comprehensive introduction to scientific computation and visualization techniques with Python applied to data intensive questions in the Natural Sciences. The class emphasizes real-world applications, providing students with essential hands-on experience using Python for data analysis and visualization, developing analytical skills for observational and modeling data, and performing virtual experiments to distinguish data contributing factors. Students will gain an understanding of the scientific data issues including: signal vs noise, trend vs periodicity, mean vs extreme changes, and accuracy vs uncertainty. Students will gain extensive experience using command line linux. Skills including local and remote file transfer and synchronization, file and directory permission, utilities for diagnosing performance issues, and data compression.
Prerequisite: MATH140.
Recommended: Familiarity with basic descriptive statistics.
Credit Only Granted for: AOSC458J or AOSC247.
Formerly: AOSC458J.

AOSC358 Special Topics in Atmospheric and Oceanic Science (1-4 Credits)
Special topics in atmospheric and oceanic science are given intensive study. The topic of concentration varies, from semester to semester and depends on student and faculty interests. Often, specialists from other institutions are invited to the campus on a visiting lectureship basis to conduct the course.
Repeatable to: 12 credits.

AOSC375 Introduction to the Blue Ocean (3 Credits)
The global ocean is a major component of the Earth System that shapes life on earth, including our weather and climate. We explore the observation-based interdisciplinary science of oceanography, identifying its strong connections to related sciences like meteorology, and geography. We apply this developing understanding to environmental issues such as marine pollution, fish and fisheries, as well as to climate variability and to the changes to the marine environment that are resulting from steadily rising levels of atmospheric greenhouse gasses. Focusses include the biogeochemical and physical changes we can observe in the nearby Chesapeake Bay and the coastal waters of Eastern Shore, Maryland.
Prerequisite: MATH120 or higher.
Recommended: MATH121, MATH141, PHYS161, or PHYS171.
Cross-listed with: GEOL375.
Credit Only Granted for: AOSC375 or GEOL375.

AOSC386 Experiential Learning (3-6 Credits)
Experiential learning in atmospheric and oceanic science.
Restriction: Junior standing or higher; and must have a learning proposal approved by the Office of Experiential Learning Programs, faculty sponsor and student's internship sponsor.

AOSC399 Independent Study in Academic Peer Mentoring (1-3 Credits)
Earn academic credit for the time spent supporting an AOSC course in the Academic Peer Mentoring Program (AMP).
Corequisite: TLTC333.
Repeatable to: 6 credits.

AOSC400 Physical Meteorology (3 Credits)
The application of basic classical physics, chemistry and mathematics to the study of the atmosphere. Composition of the atmosphere; energy sources and sinks (radiation in the atmosphere; radiative balance and radiative forcing of atmospheric processes); atmospheric thermodynamics; clouds and precipitation physics; atmospheric electricity and optics; mesoscale processes (e.g., orographic mesoscale phenomena and instabilities); air mass boundaries; severe weather, tropical cyclones; storms; global circulation.
Prerequisite: 1 course with a minimum grade of C- from (PHYS171, PHYS161, MATH141); or permission of CMNS-Atmospheric & Oceanic Science department.

AOSC401 Climate Dynamics and Earth System Science (3 Credits)
Introduction of the earth and global climate systems and their major components: atmosphere, land, ocean, biosphere and cryosphere. Key processes governing the function of the earth's climate: Global energy balance and water cycle, climate dynamics (general circulation of the atmosphere and ocean) and climate physics (aerosol, cloud and rain), as well as climate variability and climate changes. Phenomena resulting from this coupled system including El Nino-Southern Oscillation, monsoons, and the hydrological cycle will be discussed, with a focus on how the Earth System responds to global warming.
Prerequisite: AOSC400 or AOSC200; and MATH141; and (PHYS161 or PHYS171). Or permission of instructor.

AOSC420 Physical Oceanography (3 Credits)
Ocean observations. Water masses, sources of deep, intermediate, and surface water. Mass, heat, and salt transport, and the meridional overturning circulation. Geochemical tracers and cycles, including carbon. Western boundary currents, mixed layers, and processes maintaining the thermocline. Coastal and estuarine processes. Surface waves and tides. the ocean's role in climate.
Prerequisite: MATH141 and PHYS141.
Recommended: AOSC200. Also offered as: GEOL670, AOSC670.
Credit Only Granted for: AOSC420, AOSC670, or GEOL670.

AOSC424 Remote Sensing of the Atmosphere and Ocean (3 Credits)
Many of the properties of the atmosphere, ocean, and land surface are most easily observed from satellite remote sensing. This course will provide students with a hands-on introduction to a variety of passive and active sensing techniques and sensors observing our changing environment. Topics include: orbital dynamics and electromagnetic properties of the atmosphere and surface; atmospheric emission characteristics and scattering; chemical composition and spectroscopy; temperature retrievals; detection and retrieval of aerosol, cloud and rain; ocean surface properties; sea surface temperature and color; active sensing of wind stress, sea level, and internal waves; time-dependent gravity; properties of vegetation and ice.
Prerequisite: 1 course with a minimum grade of C- from (PHYS171, PHYS161, MATH141); or permission of instructor.

AOSC431 Atmospheric Thermodynamics (3 Credits)
Classical thermodynamics applied to both the dry and the moist atmosphere. Composition; phase changes of water; stability concepts; Properties of aerosols and clouds, cloud nucleation and precipitation processes, atmospheric electricity, cloud and precipitation chemistry.
Prerequisite: 1 course with a minimum grade of C- from (PHYS171, PHYS161, MATH141).
Recommended: MATH246.

AOSC432 Dynamics of the Atmosphere and Ocean (3 Credits)
Equations of motion and their approximation, scale analysis for the atmosphere and the ocean. Conservation properties. Fluid motion in the atmosphere and oceans. Geostrophic/balanced and ageostrphic/unbalanced motion. Circulation, vorticity, and potential vorticity. Introduction to the boundary layer.
Prerequisite: AOSC431.
Corequisite: MATH246.
Credit Only Granted for: AOSC432 or AOSC632.
Formerly: METO432.

AOSC433 Atmospheric Chemistry and Climate (3 Credits)
The effects of human activity on atmospheric composition, focused on global warming, the carbon cycle, air pollution, and the ozone layer. Fundamentals of atmosphereic chemistry (spectroscopy, kinetics, isotopic analysis, and biogeochemical cycles) are related to the modern understanding of climate change, air quality, and ozone depletion, based on resources such as satellite missions, field campaigns, and scientific assessments published by international agencies. We also examine how society's energy needs could be met, in the future, in a manner with less impact on atmospheric composition than the present heavy reliance on combusion of fossil fuels.
Prerequisite: CHEM131, CHEM135, or CHEM146. And MATH241; or permission of CMNS-Atmospheric & Oceanic Science department; or permission of CMNS-Chemistry & Biochemistry department. Cross-listed with CHEM433.
Credit Only Granted for: AOSC433, AOSC633, CHEM433, or CHEM633.
Formerly: AOSC434.

AOSC434 Air Pollution and Environmental Justice (3 Credits)
Basic concepts in physics and chemistry of the atmosphere as applied to air pollution and environmental justice. Production, transformation, spatial scales, transport, and removal of air pollutants. The problems of photochemical smog, the greenhouse effect & climate change, stratospheric ozone, visibility. Numerical simulation of air pollution. Health and environmental effects of air pollution in the developed and developing world; why some communities suffer disproportionately
Prerequisite: CHEM131 and MATH241; or permission of instructor.

AOSC436 Principles of Biogeochemistry (3 Credits)
An introduction to the basic principles of biogeochemistry including aspects of organic geochemistry, biochemistry, microbiology, global geochemical cycles, the origin of life and paleoenvironmental evolution.
Prerequisite: MATH120 or MATH140; or must have completed MATH220. And (GEOL100 or GEOL120); and GEOL322. And CHEM131 and CHEM132; or (CHEM135 and CHEM136).
Cross-listed with: GEOL436.
Restriction: Non-degree-seeking students require the permission of the instructor.
Credit Only Granted for: GEOL436 or AOSC436.

AOSC437 Global Climate Change: Past and Present (3 Credits)
Introduction to the processes by which climate varies, the paleoclimate record, and projections of climate change into the 21st century, including discussion of climate sensitivity to external radiative forcing.
Prerequisite: MATH115 or MATH140; and (GEOL100 or GEOL120); and (CHEM131 or CHEM135); and (CHEM132 or CHEM136).
Cross-listed with: GEOL437.
Jointly offered with: GEOL637, AOSC685.
Credit Only Granted for: GEOL437, GEOL637, AOSC437 or AOSC685.

AOSC440 Polar Remote Sensing (3 Credits)
The harsh environment of the vast polar regions makes them some of the most inaccessible places on Earth. With widespread environmental change already underway, satellite remote sensing provides the only means by which to obtain year-round observations of the polar climate system. The objective of this course is to provide students with an overview of polar remote sensing techniques, including the physical principles of active and passive sensors, orbits, electromagnetic radiation, atmospheric transmission, calibration and validation. We will focus on measurements of the polar oceans, sea ice, glaciers, ice sheets, snow and permafrost, and examine the response of the cryosphere to climate change.
Prerequisite: PHYS171 or PHYS161; and AOSC401 or GEOG301; or with permission of instructor.
Cross-listed with: GEOG440.
Jointly offered with: AOSC642.
Credit Only Granted for: AOSC440, GEOG440, AOSC642, or GEOG640.

AOSC447 Machine Learning in Earth Science (3 Credits)
A comprehensive introductory course designed to prepare undergraduate and graduate students for applying machine learning techniques to solve real-world problems in Earth science. It emphasizes practical solution implementation, providing students with essential hands-on experience using the most popular open-source analytics tools based on Python, a general-purpose programming language. The course works through all steps in machine learning, from problem specification, data analytics to analytical solution, and applies advanced statistical and analytical algorithms to uncover hidden data relationships and transform them into predictive understanding or decision support. The topics covered include: Python programming, SciPy and Scikit-learn utility, data engineering, visualization, classifiers, regression models, canonical correlation analysis, structural equation models, decision trees, random forests, boosting machines, support vector machines, clustering, dimensionality reduction, principal component analysis, and neural networks.
Prerequisite: Must have completed MATH140.

AOSC458 Advanced Topics in Atmospheric and Oceanic Science (1-4 Credits)
Special topics in atmospheric and oceanic science are given intensive study. The topic of concentration varies, from semester to semester and depends on student and faculty interests. Often, specialists from other institutions are invited to the campus on a visiting lectureship basis to conduct the course.
Repeatable to: 12 credits.

AOSC462 Ecohydrology (3 Credits)
Focuses on the study of hydrologically-controlled ecosystems, e.g. systems in which either excess and/or deficit of water and nutrients are determinants of its structure and function. Such systems have complex dynamic characteristics that depend on many interrelated links between climate, soil and vegetation.
Prerequisite: MATH240, MATH241 and MATH246; or permission of instructor.
Jointly offered with: AOSC662.
Credit Only Granted for: AOSC462 or AOSC662.

AOSC463 Water and Climate Systems (3 Credits)
Focuses on exploring the relationships between water, climate, land, energy, and the economy (the so called "nexus") through an interwoven understanding of the physical, economic, and institutional relationships and constraints that influence management and decision-making process in water supply, energy generation and food production. The course emphasizes the use of integrated assessment (IA) modeling tools as a way to formalize these relationships and explore their implications. Lectures will be complemented with online discussion sessions and applied modeling exercises to get hands-on knowledge of practical solutions to nexus challenges.
Prerequisite: MATH240, MATH241 and MATH246; or permission of instructor.
Jointly offered with: AOSC663.
Credit Only Granted for: AOSC463 or AOSC663.
Additional Information: This course is offered through a joint effort of the Earth System Science Interdisciplinary Center (ESSIC, part of UMDb Sciences) and the Joint Global Change Research Institute (a collaboration between UMD and the US Dept of Energyb Northwest National Laboratory).

AOSC470 Synoptic Meteorology (3 Credits)
Atmospheric properties and observations, meteorological analysis and charts, operational numerical forecasts. Application of quasigeostrophic theory, baroclinic instability, midlatitiude and mesoscale weather systems. Tropical meteorology. Weather forecasting using numerical and statistical models. Prediction of weather phenomena on the global, syoptic, meso, and local scales. Analysis of surface and upper air data; Norwegian cyclone model; introduction to weather forecasting.
Prerequisite: Minimum grade of C- in AOSC431 and AOSC432.
Credit Only Granted for: AOSC470, AOSC600, or METO600.

AOSC472 Mesoscale Meteorology (3 Credits)
Survey a broad range of mesoscale meteorological features with emphasis on convection and associated phenomena. Define the mesoscale and understand its underlying principles; Introduce non-convective circulations and their importance for weather forecasting; Understand the precursors and occurrence of deep moist convection.
Prerequisite: AOSC432, AOSC600, AOSC610, or AOSC470.
Jointly offered with: AOSC602.
Restriction: Non-degree-seeking students require the permission of the instructor.
Credit Only Granted for: AOSC472 or AOSC602.

AOSC475 Carbon Cycle and Climate: Past, Present, and Future (3 Credits)
The fundamentals of the Earth's carbon cycle, a key biogeochemical cycl that controls Earth's climate and life. The changing characteristics of the carbon cycle on several timescales, ranging from geological, interannual, and the more recent anthropogenic influences on carbon cycle and climate. The carbon cycle in the atmosphere, land, ocean, and the biosphere. The underlying human activities such as fossil fuel burning and deforestation that are responsible for the increase in the atmosphere CO2 and our future options in dealing with the carbon problem such as alternative energy and carbon sequestration.
Jointly offered with: AOSC675.
Credit Only Granted for: AOSC475 or AOSC6 75.

AOSC480 Introduction to Earth System Science (3 Credits)
Focuses on exploring the relationships between the atmosphere, the oceans, water, climate, land, vegetation, energy, and human systems through an interwoven understanding of the physical, biogeochemical and socioeconomic relationships and constraints that influence management and decision-making processes in societal issues such as water supply, power generation, food production, ecosystem services and others. The course introduces integrated assessment (IA) science as a framework to formalize these relationships and explore their implications.
Prerequisite: MATH240, MATH241 and MATH246; or permission of instructor.
Jointly offered with: AOSC680.
Credit Only Granted for: AOSC480 or AOSC680.
Additional Information: This course is offered through a joint effort of the Department of Atmospheric and Oceanic Science (AOSC) and the Earth System Science Interdisciplinary Center (ESSIC).

AOSC484 Climate System Modeling (3 Credits)
Fundamentals in building computer models to simulate the components of the climate system: atmosphere, ocean ice, land-surface, terrestrial and marine ecosystems, and the biogeochemical cycles embedded in the physical climate system, in particular, the carbon cycle. Simple to state-of-the-art research models to tackle problems such as the Daisy World, El Nino and global warming.
Jointly offered with: AOSC684.
Credit Only Granted for: AOSC484 or AOSC6 84.

AOSC493 Senior Research Project I (3 Credits)
Technical writing and oral presentation skills. Planning, writing, and presenting a plan for research in the geosciences.
Prerequisite: Permission of CMNS-Atmospheric & Oceanic Science department.
Restriction: Must be in Atmospheric and Oceanic Science program; or permission of instructor.

AOSC494 Atmospheric and Oceanic Science Seminar (1 Credit)
Exposure to a wide range of contemporary topics in atmospheric, oceanic, and climate sciences, to foster research interests and promote critical thinking through the weekly AOSC departmental seminar series.
Prerequisite: Minimum grade of C- in AOSC431 and AOSC432.
Restriction: Permission of the Atmospheric and Oceanic Science Department.

AOSC498 Senior Research Project II (3 Credits)
The project will be based on the research or development plan created in AOSC493. It may be completed with the approval of a faculty advisor in conjunction with an internship. Final written thesis and oral defense will be expected.
Prerequisite: AOSC493.

AOSC499 Special Problems in Atmospheric Science (1-3 Credits)
Research or special study in the field of meteorology and the atmospheric and oceanic sciences.
Prerequisite: Permission of CMNS-Atmospheric & Oceanic Science department.
Repeatable to: 6 credits.

ARAB - Arabic

ARAB101 Elementary Arabic I (3 Credits)
Introduction to modern standard Arabic in both its spoken and written form. Equal emphasis on all four skill areas: speaking, listening, reading, and writing.

ARAB102 Elementary Arabic II (3 Credits)
Continuation of ARAB101. Introduction to both spoken and written Arabic. Equal emphasis on all four skill areas: speaking, listening, reading, and writing.
Prerequisite: ARAB101; or must have appropriate World Language Placement (WLP) score.

ARAB104 Elementary Modern Standard Arabic I-II (6 Credits)
An intensive course focusing on developing functional proficiency in the standard Arabic language, both written and formal spoken. Begins with script and phonology, and develops into a limited range of situation-based texts and topics that build vocabulary, grammar, general communicative competence and cultural awareness.
Prerequisite: Must have appropriate World Language Placement (WLP) score.
Restriction: Must not be a fluent/native speaker of Arabic.

ARAB105 Elementary Modern Standard Arabic III-IV (6 Credits)
Continuation of ARAB104, developing further linguistic proficiency in Standard Arabic, both written and formal spoken. Covers an extended range of situation-based texts and topics that build vocabulary, grammar, general communicative competence and cultural awareness.
Prerequisite: ARAB104; or must have appropriate World Language Placement (WLP) score.
Restriction: Must not be a fluent/native speaker of Arabic.

ARAB169 Special Topics in Study Abroad I (1-6 Credits)
Special topics course taken as part of an approved study abroad program.
Repeatable to: 15 credits if content differs.

ARAB190 Introduction to Arab Cultures & Societies (3 Credits)
Provides an introduction to key topics related to the study of the Arabic-speaking world, including features of Arab identity in the Middle East North Africa as well as in the diaspora. Addresses religious, racial, and ethnic diversity, the history of language and culture, political economy, and migration. Students will learn about the diverse cultures and societies that have formed the changing conceptions of the Arab world through history and across different geographies. A fundamental premise is that the "Arab world" is not a monolithic, unchanging, bounded region "over there," but has long been deeply intertwined with other societies, including our own. Taught in English.

ARAB201 Intermediate Arabic I (3 Credits)
The study of Arabic in both its spoken and written forms at the intermediate level. Course will continue to develop all four skills of language acquisition: listening, speaking, reading, and writing.
Prerequisite: ARAB102; or must have appropriate World Language Placement (WLP) score.

ARAB202 Intermediate Arabic II (3 Credits)
Continuation of ARAB201, the study of Arabic in both its spoken and written forms at the intermediate level. Course will continue to develop all four skills of language acquisition: listening, speaking, reading, and writing.
Prerequisite: ARAB201; or must have appropriate World Language Placement (WLP) score.

ARAB204 Intermediate Modern Standard Arabic I (6 Credits)
Covers topics related to contemporary Arabic society, literature and culture in standard written and formal spoken Arabic. Acquisition of more complex grammatical structures, expanding vocabulary, and reading, to develop a better understanding of the formal aspects of using MSA.
Prerequisite: ARAB105; and must have appropriate World Language Placement (WLP) score.
Restriction: Must not be a fluent/native speaker of Arabic.

ARAB205 Intermediate Modern Standard Arabic II (6 Credits)
Continuation of ARAB204, with exposure to a wide range of Arabic texts from different domains. Focus on vocabulary, more complex grammatical forms, and a better understanding of the formal aspects of using MSA as well as the cultural aspects of using the language.
Prerequisite: ARAB204; or must have appropriate World Language Placement (WLP) score.
Restriction: Must not be a fluent/native speaker of Arabic.

ARAB206 Egyptian Colloquial Arabic I (3 Credits)
Develops communicative skills and cultural knowledge in Egyptian Arabic. Focuses on various social interactions, work and school situations, as well as specifics of pronunciation and grammar of the Egyptian dialect. Designed for students who have completed two years of the regular Arabic sequence classes (104-105 and 204-205) or equivalent.
Prerequisite: ARAB205; or permission of ARHU-School of Languages, Literatures, and Cultures department.
Restriction: Must not be a fluent/native speaker of Arabic.

ARAB207 Egyptian Colloquial Arabic II (3 Credits)
Further develops communicative skills and cultural knowledge in Egyptian Arabic, extending range of contexts and types of social interaction. Focuses on various aspects of Egyptian popular culture.
Prerequisite: ARAB206; or students who have taken courses with comparable content may contact the department.
Restriction: Must not be a fluent/native speaker of Arabic.

ARAB222 Arabic for Daily Life I (3 Credits)
Develops students' speaking and listening abilities in both formal Arabic and a dialect. Focus on activating vocabulary and grammar structures, speaking at the sentence level, and selecting an appropriate register based on context.
Prerequisite: ARAB102; or equivalent; or must have appropriate World Language Placement (WLP) score.
Restriction: Must not have completed ARAB202.

ARAB225 Roots and Patterns: Verb Meaning in Arabic (3 Credits)
Examines the templatic morphology of the Arabic verb system, and asks what the workings of such a system tell us about the way that humans construct and encode meaning. Moves beyond the traditional labels that are used to name the different categories of Arabic verb, to explore the conceptual structures that are coded linguistically by the various verb patterns.
Prerequisite: ARAB102; or must have appropriate World Language Placement (WLP) score.
Credit Only Granted for: ARAB499K or ARAB225.
Formerly: ARAB499K.
Additional Information: No prior linguistic training is required, but an interest in language and linguistics is assumed.

ARAB250 Food Cultures in the Global Middle East (3 Credits)
Food is the stuff of everyday routine and rich symbolic meaning, from holiday meals to daily staples. Studying food offers new perspectives on modernization, colonialism, and nationalism, and illuminates popular experiences of major historical events. This course introduces students to the history and cultures of the modern Middle East and North Africa using secondary literature and primary source materials addressing the sources and methods used in humanistic food studies scholarship. Students will gain a nuanced understanding of the diversity and complexities of the region as well as a lens for analyzing its cultures and societies from an everyday human perspective.
Credit Only Granted for: ARAB250 or ARAB499C.
Formerly: ARAB499C.

ARAB253 The Arabian Nights and the Art of Storytelling (3 Credits)
One Thousand and One Nights (Arabic Kitab alf laylah wa laylah; English The Arabian Nights) is a collection of stories and folk tales compiled in Arabic during the Islamic Golden Age, and explores how this text has shaped Western perceptions of the Arabic-Islamic world as well as its impact on the literary production of similar works in Europe and the Middle East. Taught in English.

ARAB269 Special Topics in Study Abroad II (1-6 Credits)
Special topics course taken as part of an approved study abroad program.
Repeatable to: 15 credits if content differs.

ARAB282 The Arab-Israeli Conflict through Readings in Translation (3 Credits)
Literary works by both Arab and Jewish authors depicting the impact of the conflict on society and individuals. In English.

ARAB298 Special Topics in Arabic Studies (1-3 Credits)
Language and content to be announced when course is offered.
Repeatable to: 9 credits if content differs.

ARAB301 Arab Culture and Society: Skills and Topics I (3 Credits)
Discussion of factors that drive migration from and across Arab societies, including structures of economic and social marginalization and experiences within Arab diaspora communities. Continued study of Arabic in both its spoken and written forms and study of daily life in Arabic-speaking societies. Listening, speaking, reading and writing are emphasized through engagement with increasingly advanced authentic materials.
Prerequisite: ARAB202; or must have appropriate World Language Placement (WLP) score.

ARAB302 Arab Culture & Society: Skills and Topics II (3 Credits)
Discussion of cultural, ethnic, and religious diversity in the Arabic-speaking world, including social norms and practices related to religious occasions. Continued study of Arabic in both its spoken and written forms through texts that cover major social issues in the Arab world. Listening, speaking, reading and writing are emphasized through engagement with increasingly advanced authentic materials.
Prerequisite: ARAB301; or must have appropriate World Language Placement (WLP) score.

ARAB304 Advanced Modern Standard Arabic I (3 Credits)
Advanced grammar, reading, writing, speaking in Arabic; study of contemporary Arabic society, politics, and culture.
Prerequisite: ARAB205; or permission of ARHU-School of Languages, Literatures, and Cultures department.
Restriction: Must not be a fluent/native speaker of Arabic.
Formerly: ARAB301.

ARAB305 Advanced Modern Standard Arabic II (3 Credits)
Further advanced grammar, reading, writing, speaking in Arabic; study of current issues within the Arab World.
Prerequisite: ARAB304; or students who have taken courses with comparable content may contact the department.
Restriction: Must not be a fluent/native speaker of Arabic.

ARAB315 Intensive Advanced Arabic I (6 Credits)
Intensive training in written and spoken Arabic at the Advanced-low level of proficiency. Additional intensive training in effective listening and reading skills. Substantial cultural component exploring traditions and customs of the Middle East in addition to current social issues.
Prerequisite: ARAB205; or permission of ARHU-School of Languages, Literatures, and Cultures department.
Restriction: Must not have completed ARAB304.

ARAB316 Intensive Advanced Arabic II (6 Credits)
Intensive training in written and spoken Arabic at the Advanced-mid level of proficiency. Additional training in effective listening and reading skills. Substantial cultural component exploring traditions and customs of the Middle East in addition to current social issues.
Prerequisite: ARAB304 or ARAB315; or permission of ARHU-School of Languages, Literatures, and Cultures department.
Restriction: Must not have completed ARAB305.
Credit Only Granted for: ARAB305 or ARAB316.

ARAB317 Key Moments in the History of the Middle East (3 Credits)
Provides students with an overview of major political and social events in the history of the Middle East and North Africa, with a focus on Arabic-speaking regions in the modern period. Makes use of a range of source materials and secondary readings (in Arabic and English) to illuminate how major events and changes impacted everyday life for different groups across the region. Assessments are intended to develop linguistic competence in Arabic and to guide students to become self-directed language learners and to conduct and present research on a topic of their choosing in modern Arab history.
Prerequisite: ARAB202 or must have appropriate World Language Placement (WLP) score.
Credit Only Granted for: ARAB499I or ARAB317.
Formerly: ARAB499I.

ARAB321 Arabic Media (3 Credits)
Examines the role of the Arabic media in shaping public opinion and influencing relations between the Arab world and the non-Arab world. Focus on content and acquistion of Modern Standard Arabic. Taught in Arabic.
Prerequisite: ARAB305; or permission of instructor.

ARAB322 Arabic for Daily Life II (3 Credits)
Develops students' speaking and listening abilities in both formal Arabic and a dialect, aiming to bring them to the advanced low level in speaking. Focus on activating vocabulary and grammar structures, speaking at the paragraph level, self-correction, and using both formal and informal registers of Arabic.
Prerequisite: ARAB202; or equivalent, or must have appropriate World Language Placement (WLP) score.

ARAB325 Structure and Function of the Arabic Language (3 Credits)
Facilitates logic-based understanding of Arabic grammar and syntax. Explores different grammatical structures and related elements, including through writing and translation.
Prerequisite: ARAB102; or must have appropriate World Language Placement (WLP) score.
Credit Only Granted for: ARAB398I or ARAB325.
Formerly: ARAB398I.

ARAB341 Filming War Zones: Representations of Wars in Iraq & Chechnya (3 Credits)
Comparative study of ideological and cultural discourses in war films covering military conflicts in Iraq and Chechnya in late 20th-early 21st centuries. Materials include American, Middle Eastern, and Russian feature films and documentaries; theories of propaganda, ideology and popular culture. Taught in English.
Cross-listed with: CINE341.
Credit Only Granted for: ARAB341, CINE341 or FILM341.
Formerly: FILM341.

ARAB369 Special Topics in Study Abroad III (1-6 Credits)
Special topics course taken as part of an approved study abroad program.
Repeatable to: 15 credits if content differs.

ARAB386 Experiential Learning (3-6 Credits)
Pre-professional experience in research, analysis and writing in a work setting. Project proposal approved by faculty and internship sponsor. Junior standing.
Restriction: Permission of ARHU-School of Languages, Literatures, and Cultures department.

ARAB398 Special Topics in Arabic Studies (3 Credits)
In-depth study of a particular aspect of Arabic culture, literature, and language. Specific topic to be announced when offered. Taught in Arabic.
Prerequisite: ARAB304.
Repeatable to: 6 credits if content differs.

ARAB399 Independent Study In Arabic (1-3 Credits)
Research and writing or specific readings on a topic selected by the student and supervised by a faculty member on the Department of Arabic Studies. To be planned during semester preceding registration.
Prerequisite: Permission of ARHU-School of Languages, Literatures, and Cultures department.

ARAB401 Readings in Arabic Literature (3 Credits)
A survey of Modern Arabic literature is given through a range of selected texts. Texts are studied as literature with constant reference to the social, cultural and political contexts in which they were written. Taught in Arabic.
Prerequisite: ARAB305; or permission of ARHU-School of Languages, Literatures, and Cultures department.
Restriction: Must not be a fluent/native speaker of Arabic.

ARAB410 Ideology of Stereotyping: American and Middle Eastern Film and Television (3 Credits)
Exploration of cultural stereotyping, using examples from American and Middle Eastern cinema and television. Students will examine ideological constructs of Otherness and its history, including Orientalism; propaganda techniques; and audiovisual aspects of stereotyping. While the focus is on American and Middle Eastern cultural production, the course will engage broader issues of stereotyping in contemporary society and media. Readings include theories of propaganda and cultural ideology.
Cross-listed with: CINE429Q.
Credit Only Granted for: ARAB410 or CINE429Q.

ARAB489 Special Topics in Arabic Studies (3 Credits)
In-depth study of particular aspect of Arabic language and culture. Specific topics to be announced when course is offered. Taught in Arabic.
Prerequisite: ARAB305; or permission of ARHU-School of Languages, Literatures, and Cultures department.

ARAB499 Special Topics in Arabic Studies (3 Credits)
In-depth study of particular aspect of Arabic culture, literature and language. Specific topic to be announced when course is offered.
Repeatable to: 18 credits if content differs.

ARCH - Architecture

ARCH150 Discovering Architecture (3 Credits)
Introduction to architecture and design studio education. The course examines fundamental design principles and skills related to architecture. The design studio projects apply ideas and concepts introduced in lectures, readings and on site visits. The design studio projects are both analytic and synthetic in nature. The explicit goals of the course are: To explore the discipline of architecture; To promote visual thinking and representational skills; To develop analytic design thinking skills; To learn some of the conventions of architectural representation; To enhance cultural awareness of architecture and design.
Prerequisite: Permission of ARCH-Architecture Program.

ARCH170 Design Thinking and Architecture (3 Credits)
Examines conceptual, perceptual, behavioral, and technical aspects of the built environment, and methods of analysis, problem-solving, and design implementation.

ARCH171 Design Thinking and Making in Architecture (3 Credits)
Examines iterative design processes and critical thinking skills through active learning and design thinking methodologies to solve problems and apply design as a lens of inquiry and exploration. Students will understand Design Thinking through interactive and experiential learning.
Restriction: Must be a major in ARCH-Architecture Program; and must be a freshman; or have permission of the School of Architecture, Planning and Preservation.

ARCH200 Design Media and Representation I (3 Credits)
Study of architectural representation in physical and digital design media. Examine visual literacy and visual communications through applied drawing, modeling and visual making to explore the role of design media and representation in design and design thinking.
Prerequisite: ARCH171; or permission of ARCH-Architecture Program.
Restriction: Must be in a major in ARCH-Architecture Program.

ARCH201 Elements and Principles of Architecture (1 Credit)
Survey of fundamental elements and principals of architecture and architectural education. Frames study of architecture as a profession, discipline and critical practice.
Restriction: Must be in a major in ARCH-Architecture Program.

ARCH225 History of World Architecture I (3 Credits)
Pre-1500 World Architecture survey course - History of Architecture structured to develop critical thinking and visually literacy with regard to the worldwide legacy of design thinking and cultural production through architecture

ARCH226 History of World Architecture II (3 Credits)
Post-1500 - History of Architecture survey course - History of Architecture structured to develop critical thinking and visually literacy with regard to the worldwide legacy of design thinking and building innovation in architecture

ARCH270 Design in Practice (3 Credits)
Case studies and hands-on design projects ranging in scale from a product to a building to give students insight into the process by which architects work both individually and collaboratively to put disciplinary knowledge and expertise into practice to shape our built environment.

ARCH271 People, Planet, and Profit: Building Sustainable Places (3 Credits)
An introduction to the four disciplines represented in the School: architecture and urban design, community planning, historic preservation, and real estate development, that work to create a more sustainable environment for the future to create a more sustainable environment for the future using our interpretation of the quadruple bottom line: socio-cultural, economic, environmental, and design sustainability. Students will be provided with an understanding of the fundamental scholarship and processes of each of these disciplines and examine the intersections between them. Additionally, they will learn by applying the approaches of the four disciplines through a series of field studies.
Cross-listed with: RDEV250.
Credit Only Granted for: ARCH271 or RDEV250.

ARCH272 Sustainability at College Park (3 Credits)
Explore the ways and the degrees to which University of Maryland, College Park campus master planning and operations incorporate principles of sustainability including smart growth, LEED and other building rating systems, higher education rating systems, sustainable agriculture and transportation planning. Among other subjects, students will learn about the Campus and the City of College Park and survey the relationship between local, national and global sustainability concerns. Students will learn about the University's Climate Action Plan and the roles, and extent to which, the UMD Office of Sustainability and other campus units are helping develop a carbon-neutral and resource-efficient campus infrastructure.

ARCH289 Independent Studies in Architectural Sustainability (1-4 Credits)
Independent Studies in Architectural Sustainability. Proposed work must have a faculty sponsor and receive approval of the Architecture Program Curriculum Committee and Program Director.
Restriction: Must be in a major in ARCH-Architecture Program; and permission of ARCH-Architecture Program.
Repeatable to: 6 credits if content differs.

ARCH300 Design Media and Representation II (3 Credits)
Study of architectural representation in physical and digital design media. Examine visual communications and speculative visual studies through applied drawing, modeling and making to explore expanded roles of representation in design and design thinking.
Prerequisite: ARCH200; or permission of ARCH-Architecture Program.
Restriction: Must be in a major in ARCH-Architecture Program.

ARCH350 Intro to Creative Placemaking: Practices & Principles (3 Credits)
This case-study based seminar introduces students to Creative Placemaking as a practice that leverages the power of the arts, culture, and design to support equitable, vibrant, and sustainable communities. Students analyze Creative Placemaking initiatives that elevate our shared humanity and address critical challenges, such as conversations about racial injustice, inequitable development, climate change or celebrations of the diverse communities and cultures around us. Such projects enable us to consider and imagine ethical development practices, especially in underserved and historically marginalized neighborhoods. Based on participation in creative placemaking and presentations from practitioners, they will capture the ways that artists and designers in partnership with local culture bearers and knowledge keepers can play a vital role in shaping, keeping, and making meaningful places.
Restriction: Must be in the Creative Placemaking Minor; or by permission of instructor or program director.
Credit Only Granted for: ARCH458 or ARCH350.
Formerly: ARCH458.
Additional Information: Priority will be given to students in the Creative Placemaking Minor or interested in the minor. Course may include off-campus field trips.

ARCH386 Experiential Learning (1-6 Credits)
Learning experience tied to internship of specified duration with targeted learning outcomes.
Restriction: Must have learning proposal approved by faculty sponsor and student's internship sponsor; and sophomore standing or higher; and permission of ARCH-Architecture Program.

ARCH400 Architecture Design Studio I (6 Credits)
Introduction to architectural design with particular emphasis on conventions and principles of architecture, visual and verbal communication skills, formal analysis, design process, spatial composition, architectural promenade, basic program distribution, and elementary constructional and environmental responses.
Prerequisite: ARCH300; or permission of ARCH-Architecture Program.
Restriction: Must be in a major in ARCH-Architecture Program; and permission of ARCH-Architecture Program.

ARCH401 Architecture Design Studio II (6 Credits)
Continuation of ARCH 400 with introduction to building typology, urban and contextual issues, design of the vertical surface, and architectural interiors.
Prerequisite: Minimum grade of C- in ARCH400.
Restriction: Must be in Architecture (B.S.) program.

ARCH402 Architecture Design Studio III (6 Credits)
Architectural design studio with emphasis on building and facade typologies, the development of architectural promenade and sequence, public and/or civic infill buildings dependent upon the architectural promenade, and urban housing types of varying densities. The architect's obligations to urban context are explored in many dimensions including historical, typological, and physical.
Prerequisite: Minimum grade of C- in ARCH401.
Restriction: Must be in Architecture (B.S.) program.

ARCH403 Architecture Design Studio IV (6 Credits)
Investigations into the relationship between the man-made and the natural world including introductory issues of assembly and material value. Design of the site and the building are combined into an integral process delimiting and probing the boundaries of each and exploring their reciprocal relationship. The architect's obligations to the natural and urban contexts are explored in many dimensions including historical, typological, environmental, and physical.
Prerequisite: Minimum grade of C- in ARCH402.
Restriction: Must be in Architecture (B.S.) program.

ARCH404 Graduate Architecture Design Studio I (6 Credits)
Introduction to architectural design with particular emphasis on conventions and principles of architecture , visual and verbal communication skills, formal analysis, design process, spatial composition, architectural promenade, basic program distribution, and elementary constructional and environmental responses. Offered fall only.
Recommended: For 3 1/2 year graduate students only.
Restriction: Must be in Architecture (Master's) program.

ARCH405 Graduate Architecture Design Studio II (6 Credits)
Architectural design studio with emphasis on building and facade typologies, the development of architectural promenade and sequence, public and/or civic infill buildings dependent upon the architectural promenade, and urban housing types of varying densities. The architect's obligations to urban context are explored in many dimensions including historical, typological, and physical. Offered spring only.
Prerequisite: Minimum grade of B- in ARCH404.
Restriction: Must be in Architecture (Master's) program.

ARCH406 Graduate Architecture Design Studio III (6 Credits)
Investigations into the relationship between the man-made and the natural world including introductory issues of assembly and material value. Design of the site and the building are combined into an integral process delimiting and probing the boundaries of each and exploring their reciprocal relationship. The architect's obligations to the natural and urban contexts are explored in many dimensions including historical, typological, environmental, and physical.
Prerequisite: Minimum grade of B- in ARCH405.
Restriction: Must be in Architecture (Master's) program.

ARCH407 Graduate Architecture Design IV (6 Credits)
Studio problems and theories concentrating on urbanism and urban design techniques. Issues and sites range from high-density urban in-fill to suburban and greenfield development in American and other contexts. Studio theories explore such topics as Contextualism, Neo-Traditional design, Transit Oriented Development, density, sustainable development, building typology, and street design.
Prerequisite: Minimum grade of B- in ARCH406.
Corequisite: ARCH654.
Restriction: Must be in Architecture (Master's) program.

ARCH408 Special Topics Architecture Design Studio (6 Credits)
Design Studio course to examine topical problems in architecture and urban design.
Prerequisite: ARCH400; or permission of ARCH-Architecture Program.
Restriction: Must be in a major in ARCH-Architecture Program; and permission of ARCH-Architecture Program.
Repeatable to: 12 credits if content differs.

ARCH418 Selected Topics in Architectural Technology (3 Credits)
Selected Topics in Architectural Technology
Restriction: Permission of ARCH-Architecture Program.
Repeatable to: 6 credits if content differs.

ARCH419 Independent Studies in Architectural Technology (1-4 Credits)
Proposed work must have a faculty sponsor and receive approval of the Architecture Program Curriculum Committee and Program Director.
Restriction: Permission of ARCH-Architecture Program.
Repeatable to: 6 credits if content differs.

ARCH420 History of American Architecture (3 Credits)
American architecture from the late 17th to the 21st century.
Prerequisite: ARCH225 and ARCH226; or ARCH425 and ARCH426; or permission of the ARCH-Architecture program.

ARCH423 History of Roman Architecture (3 Credits)
Survey of Roman architecture from 500 B.C. To A.D. 325.
Prerequisite: ARCH225 and ARCH226; or ARCH425 and ARCH426; or permission of the ARCH-Architecture Program.

ARCH425 History of Architecture I (3 Credits)
Pre-1500 World Architecture survey course - History of Architecture structured to develop critical thinking and visually literacy with regard to the worldwide legacy of design thinking and cultural production through architecture. Structured to nurture critical thinking and visually literacy with regard to the worldwide legacy of architecture. The work in the course will involve the evaluation of sources and arguments in reading architectural history. Architecture will be framed relative to ways of thinking, religious beliefs, cultural heritage, and cultural values.
Restriction: Permission of ARCH-Architecture Program.
Credit Only Granted for: ARCH225 or ARCH425.
Additional Information: Graduate architecture history course requires additional recitation section and additional coursework tied to survey lectures.

ARCH426 History of Architecture II (3 Credits)
Post-1500 - History of Architecture survey course - History of Architecture structured to develop critical thinking and visually literacy with regard to the worldwide legacy of design thinking and building innovation in architecture. Structured to nurture critical thinking and visually literacy with regard to the worldwide legacy of architecture. The work in the course will involve the evaluation of sources and arguments in reading architectural history. Architecture will be framed relative to ways of thinking, religious beliefs, cultural heritage, and cultural values.
Restriction: Permission of ARCH-Architecture Program.
Credit Only Granted for: ARCH226 or ARCH426.
Additional Information: Graduate architecture history course requires additional recitation section and additional coursework tied to survey lectures.

ARCH427 Theories of Architecture (3 Credits)
Survey of architectural theories - theories of architectural design, representation and urban design from antiquity to the present day.
Prerequisite: ARCH426; or permission of ARCH-Architecture Program.
Restriction: Must be in Architecture (B.S.) program.

ARCH428 Selected Topics in Architectural History (1-4 Credits)
Selected Topics in Architectural History
Prerequisite: ARCH225 and ARCH226; or ARCH425 and ARCH426; or permission of the ARCH-Architecture Program.
Restriction: Permission of ARCH-Architecture Program.
Repeatable to: 6 credits if content differs.

ARCH429 Independent Studies in Architectural History (1-4 Credits)
Proposed work must have a faculty sponsor and receive approval of the Architecture Program Curriculum Committee and Program Director.
Prerequisite: ARCH225 and ARCH226; or ARCH425 and ARCH426; or permission of the ARCH-Architecture Program .
Restriction: Permission of ARCH-Architecture Program.
Repeatable to: 6 credits if content differs.

ARCH430 Measuring Sustainability in Architecture (3 Credits)
Studies metrics of sustainability as included in rating standards, including LEED. All students will take the LEED GA test.
Restriction: Permission of ARCH-Architecture Program.

ARCH435 History of Contemporary Architecture (3 Credits)
Architectural history from World War II to the present.
Prerequisite: ARCH225 and ARCH226; or ARCH425 and ARCH426; or permission of the ARCH-Architecture Program .
Restriction: Permission of ARCH-Architecture Program.

ARCH443 Visual Communication For Architects (3 Credits)
Investigation of the relationship between drawing from life and architectural drawing, the conventions of architectural drawing and the role of architectural drawing as a means to develop, communicate, and generate architectural ideas.
Restriction: Must be in Architecture (Master's) program; and must be in the 3.5 year M. ARCH program.

ARCH445 Visual Analysis of Architecture (3 Credits)
Study of visual principles of architectural and urban precedents through graphic analysis. Exercises include on-site observation, documentation and analysis. Focuses on the development of an architect's sketchbook as a tool for life-long learning.
Prerequisite: ARCH401; or permission of ARCH-Architecture Program.
Jointly offered with: ARCH645.
Restriction: Must be in Architecture (B.S.) program.
Credit Only Granted for: ARCH445 or ARCH645.

ARCH448 Selected Topics in Visual Studies in Architecture (3 Credits)
Selected Topics in Visual Studies in Architecture
Prerequisite: ARCH400.
Restriction: Permission of ARCH-Architecture Program; and must be in a major in ARCH-Architecture Program.
Repeatable to: 6 credits if content differs.

ARCH449 Independent Studies in Visual Studies in Architecture (1-4 Credits)
Proposed work must have a faculty sponsor and receive approval of the Architecture Program Curriculum Committee and Program Director
Restriction: Permission of ARCH-Architecture Program; and must be in a major in ARCH-Architecture Program.
Repeatable to: 6 credits if content differs.

ARCH456 Great Cities (3 Credits)
Case studies from a selection of the great cities of the world.
Prerequisite: Permission of ARCH-Architecture Program.

ARCH458 Selected Topics in Urban Design (3 Credits)
Selected Topics in Urban Design
Restriction: Must be in a major in ARCH-Architecture Program; and permission of ARCH-Architecture Program.
Repeatable to: 6 credits if content differs.

ARCH459 Independent Studies in Urban Design (1-4 Credits)
Proposed work must have a faculty sponsor and receive approval of the Architecture Program Curriculum Committee and Program Director.
Restriction: Must be in a major in ARCH-Architecture Program; and permission of ARCH-Architecture Program.
Repeatable to: 6 credits if content differs.

ARCH460 Site Analysis and Design (3 Credits)
Principles and methods of site analysis; the influence of natural and man-made site factors on site design and architectural form.
Restriction: Must be in the Master of Architecture program; or permission of the School of Architecture, Planning and Preservation.

ARCH461 Sustainability in Architecture (3 Credits)
Strategies of sustainability as related to the broader context of architectural problem solving.
Restriction: Permission of ARCH-Architecture Program.
Credit Only Granted for: ARCH418S or ARCH461.
Formerly: ARCH418S.

ARCH462 Methods & Materials of Building Construction (3 Credits)
Building Construction methods and materials are examined through case studies to explore the means and techniques applied to the material execution of buildings and BIM. Focus on an understanding of the organization of the design and construction process and awareness of building and zoning codes, material systems and types.
Prerequisite: PHYS121 or equivalent; and MATH120 or MATH140 or equivalent; or permission of the ARCH-Architecture Program.
Restriction: Must be in a major in undergraduate or graduate ARCH program or Construction Project Management Minor.
Credit Only Granted for: ARCH410 or ARCH462.

ARCH463 Sustainable Systems in Architecture (3 Credits)
Sustainable systems in architecture examines the nature of the global problem, environmental economics, understanding the local environment, bioclimatic design, solar control and shading, solar access zoning, residential scale energy design issues, commercial scale energy design issues, and urban scale energy design issues.
Prerequisite: ARCH462.
Restriction: Must be in a major in undergraduate or graduate ARCH program.

ARCH464 Architectural Structures I (3 Credits)
This course covers the basic principles of architectural structures, including the influence of geometric, sectional, and material properties related to flexure and shear in beam and framed systems; vector mechanics with application to analysis of trusses, catenaries, and arches; diagrammatic analysis of beams for bending moment, shear, and deflection as well as the study of structural framing systems for vertical and lateral loads.
Prerequisite: ARCH462, ARCH463, and PHYS121; and MATH120 or MATH140, or equivalent; or permission of the ARCH-Architecture Program.
Corequisite: ARCH401 or ARCH406.
Restriction: Must be in either BS in Architecture or M.Architecture Program.
Credit Only Granted for: ARCH411 or ARCH464.

ARCH465 Architectural Structures II (3 Credits)
The basic principles of elastic behavior for different materials such as wood, steel, concrete, and composite materials and compares the properties and applications of materials generally will be covered. It investigates cross sectional stress and strain behavior in flexure and in shear, and torsion as well as the stability of beams and columns. The qualitative behavior of combined stresses and fracture in materials is also covered.
Prerequisite: ARCH464 and PHYS121; and MATH120 or MATH140, or equivalent; or permission of the ARCH-Architecture Program.
Restriction: Must be in either BS in Architecture or M. Architecture Program.
Credit Only Granted for: ARCH412 or ARCH465.

ARCH466 Environmental Systems in Architecture (3 Credits)
Environmental systems in architecture presents the theory, quantification, and architectural design implications for heating ventilating and air conditioning, water and waste, fire protection, electricity, illumination, acoustics, and vertical transportation.
Prerequisite: ARCH462 and ARCH463.
Corequisite: ARCH403 or ARCH406.
Restriction: Must be in either BS in Architecture or M. Architecture Program.
Credit Only Granted for: ARCH413 or ARCH466.

ARCH467 Integrated Project Delivery (3 Credits)
Integrated Project Delivery is examined from design to implementation through an exploration of building construction, architectural design and construction management perspectives.
Restriction: Must be in a major in ARCH-Architecture Program; or must be in Construction Project Management Minor.

ARCH468 Selected Topics in Architecture (1-4 Credits)
Selected Topics in Architecture
Prerequisite: ARCH400; or permission of ARCH-Architecture Program.
Restriction: Permission of ARCH-Architecture Program.
Repeatable to: 6 credits if content differs.

ARCH470 Computer Applications in Architecture (3 Credits)
Introduction to computer utilization, with emphasis on architectural applications.
Prerequisite: ARCH400; or permission of ARCH-Architecture Program.

ARCH472 Building Information Modeling Communication and Collaboration (3 Credits)
Building Information Modeling is explored as pertains to collaboration and communication in the design and construction of buildings and building systems. Practical and empirical learning using BIM software and case studies of real world projects and construction scenarios.
Prerequisite: ARCH400; or permission of ARCH-Architecture Program.
Restriction: Must be in a major in ARCH-Architecture Program; or must be in the Construction Project Management Minor.

ARCH478 Selected Topics in Architecture (1-4 Credits)
Selected Topics in Architecture
Prerequisite: ARCH400; or permission of ARCH-Architecture Program.
Restriction: Permission of ARCH-Architecture Program.
Repeatable to: 6 credits if content differs.

ARCH479 Independent Studies in Architecture (1-4 Credits)
Proposed work must have a faculty sponsor and receive approval of the Architecture Program Curriculum Committee and Program Director
Restriction: Permission of ARCH-Architecture Program.
Repeatable to: 6 credits if content differs.

ARCH481 The Architect in Archaeology (3 Credits)
The role of the architect in field archaeology and the analysis of excavating, recording, and publishing selected archaeological expeditions.
Prerequisite: ARCH225 and ARCH226; or ARCH425 and ARCH426; or permission of the ARCH-Architecture Program.

ARCH482 The Archaeology of Roman and Byzantine Palestine (3 Credits)
Archaeological sites in Palestine (Israel and Jordan) from the reign of Herod the Great to the Moslem conquest.
Prerequisite: ARCH225 and ARCH226; or ARCH425 and ARCH426; or permission of the ARCH-Architecture Program.

ARCH483 Field Archaeology (3 Credits)
Participation in field archaeology with an excavation officially recognized by proper authorities of local government.
Prerequisite: ARCH225 and ARCH226; or ARCH425 and ARCH426; or permission of the ARCH-Architecture Program.

ARCH488 Selected Topics in Architectural Preservation (1-4 Credits)
Selected Topics in Architectural Preservation.
Prerequisite: ARCH400; or permission of ARCH-Architecture Program.
Restriction: Permission of ARCH-Architecture Program.
Repeatable to: 6 credits if content differs.

ARCH489 Independent Studies in Architectural Preservation (1-4 Credits)
Proposed work must have a faculty sponsor and receive approval of the Architecture Program Curriculum Committee and Program Director
Restriction: Permission of ARCH-Architecture Program.
Repeatable to: 6 credits if content differs.

AREC - Agricultural and Resource Economics

AREC200 The Chesapeake Bay Ecosystem: Intersection of Science, Economics, and Policy (3 Credits)
The Chesapeake Bay is one of the most studied and monitored ecosystems in the world. To develop effective policies to restore this system to a healthier status requires integrating what we know about the biological and physical properties of the system with our understanding of the human dimension. Issues such as achieving nutrient reduction goals, restoring healthy blue crab and oyster fisheries in the bay will be used to demonstrate how economics interacts with science to guide policies that can be effective in achieving Bay restoration goals.

AREC210 The Food Chain: What Happens As Your Food Goes From Farm to Table (3 Credits)
How can we feed a growing global population, reduce farming's environmental damage, and provide a healthier diet, all in the face of climate change? The course explores these global food system challenges in the context of the food supply chains that link farms, input providers, traders, food processors, retailers, consumers, and governments. We assess how supply chains are organized; how they use technologies; and how they can create organizations, develop new technologies, and adapt food production practices to meet these four major challenges facing the global food system.

AREC240 Introduction to Economics and the Environment (4 Credits)
Costs and social impacts of pollution and human crowding in the modern environment. The economic, legal and institutional causes of these problems. Public policy approaches to solutions and the costs and benefits of alternative solutions.
Credit Only Granted for: AREC240 or AREC250 .

AREC241 Environment, Economics and Policy (4 Credits)
How can economics help us understand modern environmental problems and design better policies to solve them? This course studies the relationship between the economy, environment and policy. The importance of production, consumption, externalities, property rights and public goods in environmental issues is examined. Technological and incentive-based solutions are considered. Students will apply these concepts to evaluate current controversial environmental problems.
Credit Only Granted for: AREC240 or AREC241.

AREC250 Elements of Agricultural and Resource Economics (3 Credits)
An introduction to economic principles of production, marketing, agricultural prices and incomes, farm labor, credit, agricultural policies, and government programs.
Credit Only Granted for: AREC240 or AREC250.

AREC254 Charting a Sustainable Future: Integrating Economics and Policy for Climate Action (3 Credits)
Explores climate change through an economic perspective, focusing on how economic principles can inform effective climate policies. Students will learn about the causes and impacts of a changing climate, evaluate various policy approaches, and develop critical thinking skills. By the end of the semester, they will understand economic tools for addressing climate change and the associated political, socioeconomic, and ethical complexities.

AREC260 The Science of Gender in Economics and Development (3 Credits)
Is science an objective enterprise that qualifies researchers to investigate gender free from the constraints and prejudice of their culture? We will investigate the process by which various scientific disciplines, including anthropology, evolutionary biology, psychology, and economics do research on the topic of gender. We will describe the current state of the literature on why different sexes exist and how sex translates into gender across different societies today. With a better understanding of the sources of sex and gender, we will examine how to research the reasons behind the highly divergent economic outcomes for men and women today. We will discuss these issues in the context of the labor market in developed countries like the US as well as a variety of contexts in developing countri es. A particular focus will be the techniques for learning more about the underlying reasons for these differences, how and whether they can be overcome, and if women play a specific role in improving economic outcomes in the poorest parts of the world.
Recommended: Completion of introductory statistics recommended but not required.

AREC280 Harvesting Big Data to Examine Agriculture and Climate Change (3 Credits)
Can agricultural production keep up with climate change? The digital revolution has changed the way we analyze and interpret the world. Big data offers both opportunities and challenges that require new tools and methods of analysis. This course applies sophisticated digital tools to an age-old concern: the impact of climate on agricultural productivity. In this hands-on introduction to data analysis and visualization with real-world data, students acquire the tools to understand the impacts of environmental change and more.
Credit Only Granted for: HNUH258A or AREC280.
Formerly: HNUH258A.

AREC306 Farm Management and Sustainable Food Production (3 Credits)
The organization and operation of farm businesses are explored through principles of management, financial analysis, production economics, marketing, and business planning. These farm management principles are presented in the context of a sustainable food production system.

AREC326 Intermediate Applied Microeconomics (3 Credits)
Deepens and broadens your ability to apply rigorous economic analysis skills to a broad range of problems.
Prerequisite: ECON200, AREC250, or AREC240; and ECON201. And MATH120, MATH130, MATH136, or MATH140; or must have completed MATH220.
Credit Only Granted for: ECON306, ECON326, AREC489M, or AREC326.
Formerly: AREC489M.

AREC345 Global Poverty and Economic Development (3 Credits)
This interdisciplinary course explores social and economic development around the world. Topics include geography, democratization, political instability and conflict, health and education, agricultural development, micro-entrepreneurship, and an introduction to impact evaluation methods used to evaluate the efficacy of public policy aimed at alleviating poverty.

AREC357 Germany: Energy Transition, Climate Change, and Sustainability (3 Credits)
Interdisciplinary examination of Germany as a leading model in dealing with contemporary issues of sustainability as well as the economic, social, and political impacts of climate change in a global world. Students will learn the basics of climate change, examine policy tools (e.g. carbon taxes, regulations, incentives, etc.) and technological innovations to curb the causes of climate change and promote sustainable practices. Students will also learn how cultural values and traditions inform policy making by examining the history of the environmental movement in German cultural artifacts (e.g., art, literature, grass-roots social movements, etc.). Designed to appeal to students with a variety of backgrounds (technical, policy and government, and humanities), the course blends site visits (e.g. coal mines, government offices, technical universities, artist studios, grass-roots collectives, museums, parks, etc.) with academic lectures by experts in pertinent fields and faculty-led discussion groups. Students will receive an overarching and holistic overview of the economic, political, and cultural costs of climate change as well as current efforts to offset the negative impacts through greater sustainability. Taught in English.
Cross-listed with: GERS457.
Credit Only Granted for: AREC357 or GERS457.

AREC360 Global Agriculture: Developing Extension Education & Agriculture Technologies in Africa (3 Credits)
Identifies challenges faced by farmers in Nimba County, Liberia, and works collaboratively across borders to discuss these challenges and develop extension education programming that will be implemented in the region in order to empower local farmers. The course is designed to create a paradigm shift for both cohorts of students who will educate and learn from each other in what is now becoming a critical context - the globalized workspace. UMD and LICC students will be grouped together to identify and develop particular thematic areas most needed by local farmers, and then as a cohort create a week-long extension program to be implemented on the ground.

AREC365 World Hunger, Population, and Food Supplies (3 Credits)
An introduction to the problem of world hunger and possible solutions to it. World demand, supply, and distribution of food. Alternatives for leveling off world food demand, increasing the supply of food, and improving its distribution. Environmental limitations to increasing world food production.

AREC370 From Poverty to Progress in The World's Largest Democracy: India's Political Economy in Transition (3 Credits)
India, the largest country in the world, is home to nearly 18% of the global population. As such, India's growth and progress have profound implications for humanity's trajectory in the 21st century. This course explores India's past, present, and future through the lens of political economy. We will explore the incentives of politicians and bureaucrats as well as issues related to local governance and social movements.
Prerequisite: ECON200, AREC250 or AREC240; and one of the following: STAT100, MATH107, BMGT230, ECON230 or STAT400.

AREC380 Data Science for Environmental and Resource Economics (3 Credits)
An introduction to principles of data science using modern, open source software tools with applications to important problems in environmental, energy and resource economics. Topics include data wrangling, exploratory data analysis and visualization, modeling, forecasting, practices for reproducible research, and communication of results.
Prerequisite: AREC240, AREC241, AREC250, or ECON200.

AREC388 Internship Experience (1-6 Credits)
Internship experience in agricultural, environmental or resource economics.
Prerequisite: Permission of the Department of Agricultural and Resource Economics. Must have an internship proposal approved by the Department of Agricultural and Resource Economics.
Restriction: Junior standing or higher.
Repeatable to: 6 credits if content differs.

AREC389 Special Problems (1-3 Credits)
Concentrated reading and study in some phase of a problem in agricultural and/or natural resource economics.
Restriction: Must have permission of the Department of Agricultural and Resource Economics.
Repeatable to: 6 credits if content differs.

AREC399 Undergraduate Research (3-6 Credits)
Research in agricultural, environmental or resource economics under the direction and close supervision of a member of the AREC faculty.
Restriction: Minimum cumulative GPA of 3.0; and must have permission of the Department of Agricultural and Resource Economics.
Repeatable to: 6 credits.
Additional Information: A maximum of 6 credits of any version of AREC399 may be applied to one or more, undergraduate degrees. Any research credits completed beyond the first 6 will be included, in the total earned credits and factored into the GPA but not applied to any undergraduate, degree.

AREC405 Economics of Production (3 Credits)
The use and application of production economics in analysis of firm and policy decisions. Production functions, cost functions, multiple product and joint production, and production processes through time.
Prerequisite: ECON326 or AREC326; or students who have taken courses with comparable content may contact the department.

AREC422 Econometric Analysis in Agricultural and Environmental Economics (3 Credits)
This course offers a hands-on introduction to econometrics. Students will explore the linear regression model from the ground up by analyzing real-world datasets and learning how to distinguish causation from correlation. They will gain practical experience using econometrics to address important questions in agricultural economics and environmental economics.
Prerequisite: 1 course from (AREC326 or ECON326); and 1 course from (ECON230, ECON321, or BMGT230).
Credit Only Granted for: ECON422, ECON424, or AREC422.

AREC426 Economic Methods and Food Consumption Policy (3 Credits)
An overview of major econometric tools used by policy makers, economists and social scientists to analyze the effects of food consumption policy. Major food assistance programs in the United States such as SNAP, the School Lunch Program and the School Breakfast Program will be discussed.
Prerequisite: AREC326; or ECON326.
Credit Only Granted for: AREC489O or AREC426.
Formerly: AREC489O.

AREC427 Commodity Pricing and Markets (3 Credits)
Economic theory as applied to the marketing of agricultural commodities. How commodity prices vary with current demand and production, and how prices are linked over time, across space, and across grades.
The role played by contractual arrangements, cooperative marketing, vertical integration, and governmental policies in commodity marketing strategies.
Prerequisite: ECON326 or AREC326; or students who have taken courses with comparable content may contact the department.

AREC430 Introduction to Agricultural and Resource Law (3 Credits)
Survey of law with emphasis on problems and applications related to agricultural and natural resource economics. The course emphasizes strategies for managing legal risk arising from ownership, management, and use of agricultural resources. Students will get practical information to utilize in personal or professional settings. Contract law, constitutional law, tort law, property law, real estate transactions, business organization, estate planning, and debtor.
Prerequisite: ECON326 or AREC326.
Credit Only Granted for: AREC430 or AREC489K.
Formerly: AREC489K.

AREC431 Agricultural Water Quality: Policy and Legal Issues (3 Credits)
An overview of the American and Maryland legal systems and sources of legal information as it pertains to water quality and agriculture.
Prerequisite: AREC326; or ECON326; or students who have taken courses with comparable content may contact the department.
Credit Only Granted for: AREC489L or AREC431.
Formerly: AREC489L.

AREC433 Food and Agricultural Policy (3 Credits)
Economic and political context of governmental involvement in the farm and food sector. Historical programs and current policy issues. Analysis of economic effects of agricultural programs, their benefits and costs, and comparison of policy alternatives. Analyzes the interrelationship among international development, agricultural trade and general economic and domestic agricultural policies.
Prerequisite: ECON326 or AREC326; or students who have taken courses with comparable content may contact the department.

AREC435 Commodity Futures and Options (3 Credits)
The economics and institutional features of commodity futures and options markets. Students will develop a basic understanding of the underlying price relationships between cash and futures markets and will apply this information to business risk management decision making.
Prerequisite: AREC326; or ECON326; or students who have taken courses with comparable content may contact the department.

AREC445 Agricultural Development, Population Growth and the Environment (3 Credits)
Development theories, the role of agriculture in economic development, the agricultural policy environment, policies impacting on rural income and equity, environmental impacts of agricultural development.
Prerequisite: ECON326 or AREC326; or students who have taken courses with comparable content may contact the department.

AREC446 Sustainable Economic Development (3 Credits)
Examine why socially equitable and environmentally sustainable economic growth is difficult to achieve. It explores the interactive dynamics of environmental degradation, human capital, inequality and institutions. Emphasis is on the role of market imperfections and political failure in explaining the persistence of extractive economic institutions that hinder sustainable development.
Prerequisite: AREC326; or ECON326; or students who have taken courses with comparable content may contact the department.
Credit Only Granted for: AREC446 or AREC489G.
Formerly: AREC489G.

AREC447 The Economy of China (3 Credits)
An introductory survey course of economic development in China with emphasis on understanding the process of economic reform in mainland China since 1978.
Prerequisite: AREC326, ECON306, or ECON326.

AREC453 Natural Resources and Public Policy (3 Credits)
Rational use and reuse of natural resources. Theory, methodology, and policies concerned with the allocation of natural resources among alternative uses. Optimum state of conservation, market failure, safe minimum standard, and cost-benefit analysis.
Prerequisite: AREC326, ECON306, or ECON326; and (BMGT230 or ECON230).
Cross-listed with: ECON453.
Restriction: Must be in one of the following programs (Agricultural and Resource Economics; Agricultural and Resource Economics: Agribusiness; Agricultural and Resource Economics: Environmental and Resource Economics; Economics Bachelor of Arts; Environmental Science & Policy-Env Economics; Social Data Science-Economics; Economics minor).
Credit Only Granted for: AREC453 or ECON453.

AREC454 The Economics of Climate Change (3 Credits)
The role of economics in the formation of climate policy; basic concepts of environmental economics including efficiency, externalities, and policy instruments; economic models of intertemporal decisions and decision making in the face of uncertainty. Applied economic analysis of specific issues and current policy initiatives.
Prerequisite: 1 course with a minimum grade of C- from (AREC326, ECON306, ECON326); and 1 course with a minimum grade of C- from (ECON230, ECON321, BMGT230).
Cross-listed with: ECON484.
Credit Only Granted for: AREC454 or ECON484.

AREC455 Economics of Land Use (3 Credits)
Fundamentals of location theory. Microeconomics of land use decisions, including determination of rent and hedonic pricing models. Impacts of government decisions on land use, including regulation (e.g., zoning), incentives (transferable development rights), provision of public services, and infrastructure investments. Impacts of land use on environmental quality, including issues relating to sprawl, agricultural land preservation, and other topics of special interest.
Prerequisite: 1 course with a minimum grade of C- from (AREC326, ECON306, ECON326); and 1 course with a minimum grade of C- from (ECON230, ECON321, BMGT230).
Cross-listed with: ECON485.
Credit Only Granted for: AREC455 or ECON485.

AREC456 Energy and Environmental Economics (3 Credits)
Economic theory and empirical methods are used to study problems of energy, the environment, and the economy. It examines the extraction, production, and use of energy and market institutions and regulatory approaches used to correct market failures. Topics covered include: oil and natural gas markets, management and design of electricity markets, renewable energy, non-market valuation , climate change, and transportation policies.
Prerequisite: 1 course with a minimum grade of C- from (AREC326, ECON306, ECON326); and 1 course with a minimum grade of C- from (ECON230, ECON321, BMGT230).
Cross-listed with: ECON486.
Credit Only Granted for: AREC456 or ECON486.

AREC466 Transportation Engineering, Economics, and Policy (3 Credits)
The transportation system moves people and goods around the world, but transportation has downsides: harming local air quality, contributing to climate change, causing traffic accidents, and wasting people's time on congested roads. Mitigating these downsides will require new policies, new technologies, and new decisions by households and businesses. Focusing on the US transportation system, students will apply an integrated economics, policy, and engineering perspective to analyze transportation's most pressing challenges. Students are expected to have some background in one of the three disciplines--economics, engineering, or policy--but not all three. The beginning of the semester will include tutorials for students without much economics or engineering background.
Prerequisite: BMGT230, ECON230, ECON321, ENCE302, or PLCY304; or permission of the instructors.
Recommended: AREC326, ECON306 or ECON326.
Credit Only Granted for: AREC466 or ENCE489T.

AREC481 Environmental Economics (3 Credits)
An exploration of the use of economic incentives for protection of the environment and the determination of appropriate (or efficient) level of environmental quality. Also covers the choice of policy instruments for the attainment of environmental standards.
Prerequisite: 1 course with a minimum grade of C- from (AREC326, ECON306, ECON326); and 1 course with a minimum grade of C- from (ECON230, ECON321, BMGT230).
Cross-listed with: ECON481.
Restriction: Must be in one of the following programs (Agricultural and Resource Economics; Agricultural and Resource Economics: Agribusiness; Agricultural and Resource Economics: Environmental and Resource Economics; Economics Bachelor of Arts; Environmental Science & Policy-Env Economics; Social Data Science-Economics; Economics minor).
Credit Only Granted for: ECON481 or AREC481.

AREC489 Special Topics in Agricultural and Resources Economics (3 Credits)
Repeatable to: 9 credits.

AREC499 Honors Thesis Research (3-6 Credits)
Undergraduate honors thesis research conducted under the direction of an AGNR faculty member in partial fulfillment of the requirements of the College of AGNR Honors Program. The thesis will be defended to a faculty committee.
Restriction: Must be in the AGNR Honors program.
Repeatable to: 6 credits if content differs.

ARHU - Arts and Humanities

ARHU100 UMD Summer Writing Institute (3 Credits)
Immersive introduction to college-level writing for motivated high school students. Through academic and creative assignments, students build a polished application portfolio--including a resume, cover letter, and personal essay--tailored to a real-world opportunity like a college, internship, or scholarship. Emphasis on creativity, audience awareness, and revision. Students explore the writing process, engage in peer workshops, receive individualized feedback, and practice clear, purposeful communication across genres. Ideal for students seeking to strengthen writing skills, develop reflective practices, and gain confidence for college and beyond.
Restriction: Must be in the Terp Young Scholars program.

ARHU158 Explorations in Arts and Humanities (3 Credits)
A first-year innovation and research experience. It introduces multiple disciplinary perspectives within a given theme to understand human beings, cultures and societies. Students will learn about key questions, concepts, methods, and practices within ARHU and will engage in original humanistic research while working with campus and college tools and resources.
Restriction: Must be in a major in ARHU-College of Arts & Humanities; and freshman standing.

ARHU230 Introduction to Humanities, Health, and Medicine (3 Credits)
An overview of the historical, cultural, ethical, and spiritual dimensions of medicine, human health, disease, and death from the points of view of various humanistic disciplines.
Cross-listed with: ENGL254, HIST219N, WGSS230.
Restriction: Permission of ARHU-History Department.
Credit Only Granted for: ARHU230 , ENGL289C, ENGL254, ARHU298A, HIST219N, or WGSS230.

ARHU240 Arts Organizations and Audiences in the United States (3 Credits)
An introduction to the history and role of arts organizations in the U.S., as well as the respective audiences and populations they serve. This grounding allows artists and emerging administrators to understand the events and questions that have shaped the field, and develop strategies for advancing sustainable arts organizations in the future.
Cross-listed with: TDPS240.
Credit Only Granted for: TDPS258C, TDSP240 or ARHU240.
Formerly: TDPS258C.

ARHU264 What Are the Liberal Arts? (3 Credits)
Explore what we call "the liberal arts" and "the humanities," which have historically formed the foundations of higher education. What is the role of learning in human life, and what are the ultimate ends of education? How does the idea of a liberal arts education take shape--from ancient Greece, to the medieval world, to the post-Enlightenment explosion of the sciences, to the modern disciplines of the humanities? What can you expect from the humanities curriculum at the University of Maryland, as opposed to a liberal arts college such as St. Johns College in Annapolis?
Cross-listed with: ENGL264.
Credit Only Granted for: ENGL264 or ARHU264.

ARHU269 Special Topics in Study Abroad II (1-6 Credits)
Special topics course taken as part of an approved study abroad program.
Repeatable to: 15 credits if content differs.

ARHU269A Morocco: In the Footsteps of the Beat Generation (3 Credits)
Educates students about the history, culture and socio-political situation in Morocco through the reading of fiction related to this country. The focus will be on the intersection of American and Moroccan culture and will cover film, music and literature. The American perception of the "orient" has historically been channeled through the French characterization of Arab societies in North Africa. This course aims to disentangle this western mythology from reality in Morocco. Some of the themes addressed will be globalization, colonialism, racism, orientalism, and women's oppression
Cross-listed with: ENGL269M.
Credit Only Granted for: ARHU269A or ENGL269M.

ARHU270 Quantum Steampunk Science-Fiction Workshop (3 Credits)
Steampunk is a science-fiction genre in which futuristic technologies populate Victorian-era settings. Recently, steampunk has come to life in the scientific field of quantum thermodynamics. Thermodynamics, the study of energy, grew out of the Industrial Revolution. Two centuries later, quantum physics is transforming computing and cryptography. Quantum science is now revolutionizing 19th-century thermodynamics in quantum thermodynamics, which features quantum engines, automata, and more. Quantum thermodynamics inspired the growing subgenre of quantum steampunk. In this course, you will read science fiction, write quantum steampunk short stories, receive feedback, and critique classmates' writing. In parallel, you will learn about quantum physics, technologies, and thermodynamics.
Cross-listed with: CHEM298Q, CMSC298Q, ENME299Q, PHYS299Q.
Credit Only Granted for: ARHU270, ARHU298Q, CHEM298Q, CMSC298Q, ENME299Q or PHYS299Q.

ARHU271 Creative Writing Cross-Cultural Perspectives in Poetry and Fiction (3 Credits)
Students immerse themselves in the study and practice of multicultural fiction and poetry, fostering a broad appreciation of diverse voices and storytelling styles. Through engaging discussions, students will explore themes and techniques from various cultural perspectives. Writing exercises encourage experimentation across genres, allowing students to discover and refine their unique voices. In a supportive workshop environment, students will share their original work, receive constructive feedback, and engage in collaborative refinement. The course culminates with students compiling their work into an online portfolio and presenting selected pieces in a final reading with peers.
Credit Only Granted for: ARHU298J or ARHU271.
Formerly: ARHU298J.

ARHU275 Writing for the Stage and Screen: An Introductory Workshop (3 Credits)
Introduction to the theory and practice of scriptwriting with an opportunity to read, view, evaluate, write, and revise texts meant to be performed. Students will practice writing for the stage, film, and television and also examine selected scripts, performances, and film and television clips as models for their own creative work. Students will complete frequent writing exercises, participate in workshops, and learn to apply scholarship to the analysis and critique of scripts.
Cross-listed with: ENGL275.
Credit Only Granted for: ENGL275 or ARHU275.

ARHU286 Experiential Learning (3-6 Credits)
Designed for students who are in their first semester at the University of Maryland and/or students who wish to complete legislative internships, some start-up internships and some remote internships. All students must be enrolled in an ARHU major or minor and the internship must be in one of the academic fields covered within the College of Arts and Humanities. In addition to completing their required hours on site, students will be required to attend three bi-weekly seminars at the beginning of the semester to help develop their para-professional goals and understandings.
Prerequisite: Permission of ARHU-College of Arts & Humanities.
Restriction: Minimum cumulative GPA of 2.5; and must be in a major or minor in ARHU - College of Arts and Humanities.

ARHU298 Special Problems in Arts and Humanities (3 Credits)
Repeatable to: 6 credits if content differs.

ARHU298L "Are you - Nobody - too?" Why we create and share stories, poems, comics and zines (3 Credits)
Our ability to create and maintain meaningful social connections tells us that we are not alone; it reminds us that we are connected to something larger, a community, a group of people willing to celebrate our triumphs and help us cope during difficult times. Emphasizing the principles of participation, connection, and collaboration, this course explores how various traditionally marginalized people form their own cultural communities and develop a sense of reciprocal belonging through the creation (and independent distribution) of stories, poems, spoken word poetry, comics and zines.In spite of intersectional obstacles such as the lack of political power, access to resources and economic opportunities, these communities may find it possible to redefine their place in society by demonstrating originality, resilience, and talent.

ARHU299 Studies in Humanities Technology (1-3 Credits)
Selected topics in the use of Information Technology in the Humanities.
Prerequisite: Permission of instructor.
Repeatable to: 6 credits if content differs.

ARHU300 Writers' House Colloquium: Welcome to Writers' House; Writing Your Manifesto (1 Credit)
Welcomes new students into Jimenez-Porter Writers' House, a literary center for the study of creative writing across cultures and languages, and helps them to understand, develop and write their own artist statement (aka Artist Manifesto). Students will explore the creative and intellectual traditions of our community, their craft and future careers, understand what these traditions are, how they have evolved over time and place, and why they matter. Emphasis will be placed on community building, engagement and participation, with presentations from the editorial staff of Stylus, executive board of Terpoets, Novelist Support Group as well as other professional development opportunities.
Restriction: Must be in the Jimenez-Porter Writers' House Living-Learning Program.

ARHU308 Critical Eras: An Interdisciplanary View (3 Credits)
An interdisciplinary exploration of a critical period, ranging from a year to an era, stressing the relationship between different forms of human expression and the social milieu.
Repeatable to: 6 credits if content differs.

ARHU309 Writers' House Colloquium: Creative Writing in Community (1-3 Credits)
Colloquium designed to improve students' skills in literary and communication arts through lectures, workshop and discussions on the history and craft of writing across cultures. Topics include poetry and fiction in translation, and exploration of modes of critique, elements of craft of fiction and poetry, writing for different media, genre writing, writing for performance, screen or scriptwriting and creative non-fiction.
Prerequisite: Permission of ARHU-College of Arts & Humanities; and must be admitted to the Jimenez-Porter Writers' House.
Repeatable to: 6 credits if content differs.

ARHU318 Writers' House Colloquium: Creative Writing Across Languages and Cultures (1-3 Credits)
Colloquium designed to improve students' skills in literary and communication arts through lectures and discussions on the history and craft of writing across cultures. Topics for the different versions of ARHU 318 include poetry, fiction, writing for different media, autobiography and memoir, scriptwriting, screenwriting, and community engagement projects.
Prerequisite: Permission of ARHU-College of Arts & Humanities; and must be admitted to the Jimenez-Porter Writers' House.
Repeatable to: 6 credits if content differs.

ARHU319 Writers' House Second Year Colloquium: Form and Theory of Creative Writing (1-3 Credits)
Required course for Writers' House students pursuing the notation program. Offered in either poetry or imaginative prose writing. Students work at the intermediate level, refining creative writing skills through cross-cultural reading and writing exercises. As part of the course, students attend a series of lectures and readings given by professional writers.
Restriction: Must be in the Jimenez-Porter Writer's House program.
Repeatable to: 6 credits if content differs.

ARHU320 Writers' House Second Year Colloquium: Writing for Publication (3 Credits)
Students write, discuss and revise for multiple forms of publication: reading their own work at least once in public, sending work out for publication to literary journals, and producing a chapbook of high quality by end of semester.
Recommended: Completion of ARHU318 and ARHU319 recommended.
Restriction: Currently enrolled in Writers' House or permission of program.
Credit Only Granted for: ARHU319A or ARHU320.
Formerly: ARHU319A.

ARHU338 Undergraduate Teaching Assistantship in a Living Learning Program (1-3 Credits)
Offers exceptional students the opportunity to work closely with a faculty member and gain valuable experience. ARHU Living learning program UTAs also serve as peer mentors and program leaders. They assist with course planning, research, and student advising (as appropriate). We are also allowing for variable credit (1-3 cr hrs).
Restriction: Sophomore standing or higher; and must be in an ARHU Living Learning Program or be a graduate of the program; and must have permission of the Living Learning Program to enroll.
Repeatable to: 6 credits if content differs.

ARHU340 Arts Entrepreneurship and the Creative Profession (3 Credits)
Introduces students to arts entrepreneurship in preparation for diverse and ever-changing careers in the creative fields. Students will practice and develop their entrepreneurial mindsets and learn about different frameworks for audience engagement. Topics include financial management, revenue development, business planning, and the "need-to-knows" of the gig economy. Throughout the semester, students will have the opportunity to learn from a variety of entrepreneurs in the arts and to evaluate their future career paths.
Recommended: ARHU240.
Cross-listed with: MUSC448E.
Credit Only Granted for: ARHU340 or MUSC448E.

ARHU350 Chilean Culture, Democracy, and Social Change (3 Credits)
Short term education abroad course offered in Summer term, in Santiago and Valparaiso, Chile. An exploration of both the conditions that led to the 1973 coup d'etat in Chile, and the complex legacy left by the following dictatorship, including competing economic philosophies that are underpinned by religious, historical, and ideological components. This course focuses on how the arts and literature continued to flourish during the dictatorship, and how they have played a continuing role in the country's recovery from its traumatic past.
Credit Only Granted for: ARHU350, ARHU369C, CMLT498C, GVPT309F, HIST329N, HONR349C.
Formerly: ARHU369C.

ARHU351 James Joyce's Dublin: A multi-media Odyssey (3 Credits)
Chapter by chapter analysis of the text with in situ tours to settings important to the book, and examination of the culture and circumstances from which it arose; review of the impact of Ulysses, and continuing controversies around the text. Multi-media explorations and creative projects will be included in course activities: collaborations on tumblr, and the use of such technologies as vine, instagram, twitter, etc., in an exploration of how our subjective experiences and the expressions they inspire are impacted by new technologies.
Credit Only Granted for: ARHU369I, ARHU351, ENGL369J, or HONR349L.
Formerly: ARHU369I.

ARHU358 Becoming Worldwise and Worldready: Finding Success in College and Life (1 Credit)
Designed to help students navigate the various resources that exist at a large, Research 1 university like the University of Maryland. The course focus is helping them better understand the groundwork needed to transition successfully from underclassman to upperclassman, from an outside major into ARHU or from an external school to UMD, and ultimately from college into life post-graduation.
Restriction: Must be enrolled in a major in the College of Arts and Humanities.
Repeatable to: 3 credits if content differs.

ARHU369 Special Topics in Study Abroad III (1-6 Credits)
Special topics course taken as part of an approved study abroad program.
Repeatable to: 15 credits if content differs.

ARHU375 The TV Writers Room Screenwriting for Television and Video (3 Credits)
Students engage with the theory and practice of screenwriting for television and video. Students read and watch teleplays designed to teach advantages of the television format. Students apply what they learn to prepare frequent writing exercises, share and provide feedback for peers scripts in a workshop format, and work together as a Writers Room to prepare an original pilot episode.
Prerequisite: ARHU275, ARHU318, or FILM370; and permission of instructor.
Additional Information: Priority in enrollment will be given to students participating in the Jimenez-Porter Writers' House and Cinema & Media Studies programs.

ARHU376 Writing the Feature Film (3 Credits)
Examines the creative process of developing and writing a feature-length screenplay. Students will experience a collaborative workshop environment, researching stories, pitching feature film ideas, creating a logline, developing a detailed beat sheet and, ultimately, writing a complete first draft of the screenplay.
Prerequisite: ENGL275, ARHU275, ARHU375 or THET340; or permission of instructor.
Cross-listed with: CINE376.
Credit Only Granted for: ARHU376 or CINE376.

ARHU380 Arts & Humanities in Social Innovation, Change, and Justice: Do Good Now (3 Credits)
The course serves as the core course for the Arts-and-Humanities track in PLCY's minor in "Nonprofit Leadership and Social Innovation." Students will be introduced to the role that the Arts and Humanities can play in social innovation and social change, while exploring various mechanisms for achieving impact with a focus on advancing social justice, equity and systems change. This course deepens understandings of nonprofit leadership, entrepreneurship and social innovation by guiding students through the creation and implementation of social change projects and ventures of their choice.
Cross-listed with: JWST319P.
Credit Only Granted for: ARHU380, BSOS388B, JWST319P, or PLCY388D.

ARHU386 Experiential Learning (3-6 Credits)
Prerequisite: Permission of ARHU-College of Arts & Humanities.
Restriction: Junior standing or higher.

ARHU398 Special Topics in Arts and Humanities (3 Credits)
An in-depth exploration of thematic topics in Arts and Humanities.
Repeatable to: 9 credits if content differs.

ARHU439 Interdisciplinary Studies in Arts and Humanities (3 Credits)
An interdisciplinary exploration of chronological, geographical or thematic topics in Arts and Humanities.
Repeatable to: 6 credits if content differs.

ARHU440 Arts Leadership Seminar (3 Credits)
An advanced seminar that connects arts leadership to current trends in technology, demographics, policy, and the economy. Through an investigation of current events, leadership theory, and case studies and guest speakers from the field, students will evaluate arts leadership as a profession and develop their own unique leadership identity. Topics included strategic management, organizational culture, ethics, decision making, and partnerships.
Prerequisite: ARHU240; or permission of instructor.
Cross-listed with: TDPS440.
Credit Only Granted for: ARHU440 or TDPS440.

ARHU441 Arts Entrepreneurship: Theory and Practice (3 Credits)
Establishes arts entrepreneurship as a unique discipline with the goal of connecting creative initiatives (products, artforms, and programs) to audiences, resources, and communities. Introduces students to the ways in which creative initiatives both create value and offer solutions to social, political, environmental, and cultural issues. Students will develop artist impact statements and identify different contexts and ways to apply their talents and creative initiatives in society.
Prerequisite: ARHU240 or TDPS240; or permission of instructor.
Recommended: ARHU440 or TDPS440.
Cross-listed with: TDPS441.
Jointly offered with: ARHU640, TDPS640.
Restriction: Limited to 4 undergraduate students (2 in ARHU and 2 in TDPS).
Credit Only Granted for: TDPS458E, ARHU441, TDPS441, ARHU640 or TDSP640.
Formerly: TDPS458E.

ARHU458 Graduate School Preparation (1 Credit)
Designed for Juniors and Seniors in the College of Arts and Humanities who are interested in applying to graduate school. Topics include skills needed for the graduate school search and application process, evaluation and reflection of application materials, interview and essay preparation, and exploration into career options after graduate school. Focus is on the Arts and Humanities fields, and is not necessarily intended for students planning on attending professional school (law school, medical school, etc.). The course is also not intended for students who are already participating in a Plus-1 program.
Restriction: Must have earned a minimum of 60 credits; must be in a major in the College of Arts and Humanities.
Repeatable to: 3 credits if content differs.

ARHU468 Peer Mentoring Program (1 Credit)
A workshop for sophomore, junior or senior students who wish to serve as peer mentors helping first-year students to cope with the numerous issues which often arise in the transition to the university.
Restriction: Sophomore standing or higher; and permission of ARHU-College of Arts & Humanities.
Repeatable to: 6 credits if content differs.

ARHU486 Internship Practicum in Arts and Humanities (3-6 Credits)
An internship intended for students who have already completed an internship for credit. ARHU486 must be a different experience from the internship students have already taken for credit. Generally students intern with a different company, but they may continue working for the same company if the job is significantly different. See ARHU internship coordinator for details.
Prerequisite: Have completed previous internship at U of MD.
Restriction: Must be in a major in ARHU-College of Arts & Humanities; and permission of ARHU-College of Arts & Humanities; and minimum cumulative GPA of 2.5; and must have earned a minimum of 60 credits; and completed 12 credits at U of MD.

ARHU489 Advanced Internship Practicum in ARHU (3-6 Credits)
Designed for students who have already completed at least 2 upper level internship courses for academic credit. It is an advanced practicum to assist students in continuing to develop and hone their professional writing, presentation and analytical skills.
Prerequisite: ARHU486.
Restriction: Must be in a major in ARHU-College of Arts & Humanities; and minimum cumulative GPA of 2.5; and permission of instructor.
Repeatable to: 6 credits if content differs.
Additional Information: Course is designed to follow ARHU486.

ARHU498 Special Topics in Arts and Humanities (3 Credits)
Repeatable to: 6 credits if content differs.

ARHX - Art History & Archaeology Education Abroad

ARHX100 Art of Rome (3 Credits)
An introductory course in the history of art. The course focuses on Rome, from its origin to contemporary times. Masterpieces of painting, sculpture, architecture and urban planning are examined within their historical contexts. The course hones a method of description, critical analysis and interpretation of art and builds an understanding of traditional forms and cultural themes useful in the comprehension of all western art.
Additional Information: This course is offered as part of the Maryland-in-Rome study abroad program. Students must apply for this program through Education Abroad: More information at ter.ps/UMRome. Education Abroad processes registrations for this course on behalf of students.

ARHX201 Media, Art and Social Activism (3 Credits)
Focuses on media that have been created expressly for communicating and/or promoting positive social change, blending social theory with aesthetics and civics. The course investigates current trends in visual communication, as well as the methods for how to analyze and contextualize these, with an emphasis on politics in art and new media.
Additional Information: This course is offered as part of the Maryland-in-Rome study abroad program. Students must apply for this program through Education Abroad: More information at ter.ps/UMRome. Education Abroad processes registrations for this course on behalf of students.

ARHX205 Art Histories: An Introduction to the Visual Arts in London (3 Credits)
Focuses on the rich visual resources of London by exploring histories and theories of art while examining issues of museology, curatorial practice, and art criticism. This course helps develop skills of visual analysis and provides an understanding of a range of artistic movements and the themes, preoccupations, and stylistic forms which characterize them.
Additional Information: This course is offered as part of the ARHU-in-London study abroad program. Students must apply for this program through Education Abroad: More information at globalmaryland.umd.edu/offices/education-abroad/program/11854. Education Abroad processes registrations for this course on behalf of students.

ARHX206 History of Italian Design (3 Credits)
The history of design and production in Italy from the industrial revolution to the present, ranging from industrial, to product, to furniture design; giving attention to the extraordinary blend of imagination and exactitude that characterizes Italy. During the semester we will trespass in the world of fashion design as well as that of car styling. Particular importance will be given to the parallel production of visual arts, cinema, literature and other fields of culture.
Credit Only Granted for: ARTH269D or ARHX206.
Additional Information: This course is offered as part of the Maryland-in-Florence study abroad program. Students must apply for this program through Education Abroad: More information at ter.ps/UMFlorence. Education Abroad processes registrations for this course on behalf of students.

ARHX300 The Art of Florence: Exploring Visual Culture (3 Credits)
During the Renaissance, the city of Florence was the site of some of the most remarkable artistic experiences in European history. Why, though, should one city have contributed so much to the course of the arts? Why should so many of the city's works of art, monuments, and buildings have played a major rule in the development of the visual arts? What set of circumstances and conditions made this possible? This course is designed to explore these questions through an examination of historical factors that made Florence the birthplace and point of reference for what we now call "Renaissance art."
Additional Information: This course is offered as part of the Maryland-in-Florence study abroad program. Students must apply for this program through Education Abroad: More information at ter.ps/UMFlorence. Education Abroad processes registrations for this course on behalf of students.

ARHX301 New Perspectives: Visual Technology in Renaissance and Baroque Art (3 Credits)
This interdisciplinary course explores the depiction of visual space in Renaissance and Baroque Art through the medium of modern technologies. The visual theories of authors including Leon Battista Alberti, Piero della Francesca and Leonardo da Vinci will be given practical application through the use of the digital design software Autodesk Autocad.
Additional Information: This course is offered as part of the Maryland-in-Rome study abroad program. Students must apply for this program through Education Abroad: More information at ter.ps/UMRome. Education Abroad processes registrations for this course on behalf of students.

ARHX302 Raphael and The High Renaissance in Florence and Rome (3 Credits)
This course will examine the career and achievements of Raphael (1483-1520), and will consider the artist in the context of the High Renaissance in Florence and Rome. It will consider the sources and documents for his career, as well as the later historiography, and it will include study of the many works by Raphael in Rome and in the Vatican Museums.
Additional Information: This course is offered as part of the Maryland-in-Rome study abroad program. Students must apply for this program through Education Abroad: More information at ter.ps/UMRome. Education Abroad processes registrations for this course on behalf of students.

ARHX303 Nordic Contemporary Art (3 Credits)
Focuses on current trends and the dynamics of regional identity in contemporary art, art history, and curating. The Stockholm art scene is used as an entry-point to analyze artworks, exhibitions and texts: What is contemporary, and what is Nordic, about the art and issues that surface here?
Additional Information: This course is offered as part of the Maryland-in-Stockholm study abroad program. Students must apply for this program through Education Abroad: More information at ter.ps/UMStockholm. Education Abroad processes registrations for this course on behalf of students.

ARHX304 Contemporary Spanish Art (3 Credits)
A dynamic, multi-disciplinary introduction to Contemporary Art in Spain. We will discuss recent classics as well as emerging artists, and we will cover a wide range of artistic practices, from photography to afterpop music, including installation art, performance art and comic art.
Additional Information: This course is offered as part of the Maryland-in-Barcelona study abroad program. Students must apply for this program through Education Abroad: More information at ter.ps/UMBarcelona. Education Abroad processes registrations for this course on behalf of students.

ARHX310 The Business of Art: The Economics and Management of Culture (3 Credits)
Markets for visual arts provide a particularly fertile ground for those concerned with the economics of culture. The study of the past and current structure of the market for visual art, the mechanisms that fuel this flourishing market and the involvement of public and private institutions in the context of the current globalization of the arts, provides significant instruments for the development of museum management studies, as well as a different methodological approach to art history and history of culture management.
Additional Information: This course is offered as part of the Maryland-in-Florence study abroad program. Students must apply for this program through Education Abroad: More information at ter.ps/UMFlorence. Education Abroad processes registrations for this course on behalf of students.

ARHX311 Feminism in Art (3 Credits)
Explores the developing presence of female artists in visual art and contemporary culture through seminars, exhibitions, and theater shows. Analyzes the relationship of women in the history of contemporary art and their contribution to both conceptual and linguistic innovation, and feminism as the most radical cultural transformation of the contemporary era.
Additional Information: This course is offered as part of the Maryland-in-Florence study abroad program. Students must apply for this program through Education Abroad: More information at ter.ps/UMFlorence. Education Abroad processes registrations for this course on behalf of students.

ARHX312 20th Century Italian Art (3 Credits)
Explores artistic movements in Italy over the last century, beginning with an exploration of the roots of avant-garde trends in the 19th century and moving into Divisionism, Macchiaioli, Futurism, Metaphysical painting, the abstract movement of the 1930's, Arte Povera as well as the art of the present.
Additional Information: This course is offered as part of the Maryland-in-Florence study abroad program. Students must apply for this program through Education Abroad: More information at ter.ps/UMFlorence. Education Abroad processes registrations for this course on behalf of students.

ARHX313 London and its Museums (3 Credits)
Through weekly visits to varying museums around London, this course equips students to consider history in a broader perspective, evaluate exhibition experiences, and apply research to museum studies. Explores London's collections to contextualize and critically evaluate the cultural and historical value, purpose, and educational role different types of exhibiting space hold.
Additional Information: This course is offered as part of the ARHU-in-London study abroad program. Students must apply for this program through Education Abroad: More information at ter.ps/ARHULondon. Education Abroad processes registrations for this course on behalf of students.

ARHX314 Michelangelo: Painter, Sculptor, Architect (3 Credits)
Explores the life and work of Michelangelo, one of the most revolutionary, respected, and influential Renaissance artists. Focuses on four main and interrelated areas, and the dynamic relationships between them: painting, sculpture, architecture, and drawing. Looks at Michelangelo's works, working process, interactions with patrons, and his impact on others. Also explores Michelangelo's works in person in museums, churches, piazza, and town halls.
Credit Only Granted for: ARTH369M or ARHX314.
Additional Information: This course is offered as part of the Maryland-in-Florence study abroad program. Students must apply for this program through Education Abroad: More information at ter.ps/UMFlorence. Education Abroad processes registrations for this course on behalf of students.

ARHX315 Archaeology and Art of Ancient Italy (3 Credits)
Provides an overview of Ancient Italy from the 8th century B.C.E. to the 5th century C.E. as interpreted through archaeology, the study of past cultures and societies through their material remains. Explores varieties of archaeology and examines theory, methods, and techniques for investigating and reconstructing the past through a combination of in-class lectures, field trips, site visits to museums and archaeological digs in Tuscany.
Additional Information: This course is offered as part of the Maryland-in-Florence study abroad program. Students must apply for this program through Education Abroad: More information at https://globalmaryland.umd.edu/offices/education-abroad/program/11293. Education Abroad processes registrations for this course on behalf of students.

ARMY - Army

ARMY105 Basic Military Science II (3 Credits)
Exploration of the Army Leadership Model through classroom instruction, leadership training and mentorship. Develops knowledge and competency in physical fitness through rigorous training and experiential leadership education through leadership laboratories.
Credit Only Granted for: ARMY119 or ARMY105.

ARMY106 Basic Military Science I (3 Credits)
Introduction to the personal challenges and competencies that are critical for effective leadership and communication. Develops knowledge and competency in physical fitness through rigorous training and experiential leadership education through leadership laboratories.
Restriction: Students must meet Officer candidate criteria to participate in field training.

ARMY110 Intro to Army Military History (3 Credits)
This course is composed of 46 modules, including 43 lessons and 3 exams, covering military history from early colonial warfare in the eighteenth century to the global war on terrorism in the twenty-first century. The course begins with a pretest, which provides the learner with insight into what will be covered in the course and an opportunity to gauge their knowledge coming into the course. Each lesson will include readings and an Interactive Multimedia Instruction (IMI) piece. Discussion activities, writing assignments, and midterm and final exams will allow students to synthesize what they have learned.
Restriction: Must be in the Army ROTC program.

ARMY201 Army Leadership Development (3 Credits)
This course is an intensive examination of the Army Leadership Model in practice. The model is compared to leadership styles and techniques from government and industry and the comparative effectiveness of each. Students form their own personal leadership styles.
Restriction: Sophomore standing or higher.

ARMY202 Military Leadership in Practice (3 Credits)
This course uses the case study method to examine the Army Leadership Model as applied to assigned missions in U.S. history. Students learn to evaluate and assimilate effective leadership methods and techniques. Includes a laboratory period in which case studies are worked out and presented by individuals and groups.

ARMY301 Advanced Military Leadership I (3 Credits)
Reinforces understanding and application of Army leadership strategies, critical decision making methodologies, physical and mental fitness excellence. Includes a laboratory period in applied leadership, common military tasks and physical fitness.

ARMY302 Advanced Military Leadership II (3 Credits)
Prepares contracted students for certification at the Army National Advance Camp, a prerequisite for commissioning as an officer in the U.S. Army. Focus is directed to military tactics, squad and platoon drills, marksmanship, land navigation and fitness excellence. Includes a laboratory period in applied leadership skills as well as a three day field exercise.

ARMY401 Advanced Military Leadership III (3 Credits)
Introduces contracted students to the study of Army structure, practices and processes exercised by Army Commanders and Staff in completing personnel, logistics, training and combat operations. Includes a laboratory in applied leadership skills and two field exercises.

ARMY402 Advanced Military Leadership IV (3 Credits)
The military system and code of ethics in the military environment is studied. Topics include code of conduct during all forms of military operations, the Geneva Conventions and the ethical decision making process. Also includes a laboratory in applied leadership skills, fitness excellence and two field exercises.

ARSC - Air Science

ARSC100 Heritage and Values I (1 Credit)
Freshman course for AFROTC cadets. Introduces students to the United States Air Force and encourages participation in Air Force Reserve Officer Training Corps. Featured topics include: overview of ROTC, special programs offered through ROTC, mission and organization of the Air Force, brief history of the Air Force, introduction to leadership and leadership related issues, Air Force Core Values, Air Force officer opportunities, and an introduction to communication studies. Leadership laboratory is mandatory for AFROTC cadets and complements this course by providing cadets with followership experiences.
Corequisite: AFROTC cadets must also register for ARSC059.

ARSC101 Heritage and Values II (1 Credit)
Freshman course for AFROTC. Continuation of ARSC100 for freshmen AFROTC cadets. Study of topics relating to the Air Forces and defense. Focuses on organizational structure and missions of the Air Force; officership and an introduction to both written and oral communication skills.
Corequisite: AFROTC cadets must also register for ARSC059.

ARSC200 Team and Leadership Fundamentals I (1 Credit)
Sophomore course for AFROTC cadets. Study of factors contributing to the development of air power from its earliest beginnings through two world wars; the evolution of air power concepts and doctrine; introductory leadership; and assessment of communicative skills.
Corequisite: AFROTC cadets must also register for ARSC059.

ARSC201 Team and Leadership Fundamentals II (1 Credit)
Continuation of ARSC 200 for sophomore AFROTC cadets. The study of historical events, leaders, and technical developments which surrounded the growth of air power; the basics of leadership; environment of an Air Force officer; and concepts of ethical behavior.
Corequisite: AFROTC cadets must also register for ARSC059.

ARSC300 Leading People and Effective Communication I (3 Credits)
The study of leadership and management fundamentals, professional knowledge, Air Force doctrine, and written and oral communication skills. Case studies are used to examine leadership and management situations. This course will satisfy credit toward a minor in military studies.
Corequisite: AFROTC cadets must also register for ARSC059; or permission of UGST-AFROTC-Air Science.
Restriction: Junior standing or higher.

ARSC301 Leading People and Effective Communication II (3 Credits)
Continuation of ARSC300. Study of leadership and management skills and leadership ethics as well as written and oral communication skills required of Air Force officers. This course will satisfy credit towards a minor in military studies.
Corequisite: AFROTC cadets must also register for ARSC059; or permission of UGST-AFROTC-Air Science.
Restriction: Junior standing or higher.

ARSC399 Independent Study in Air and Space Power Implementation (1-3 Credits)
Independent study to broaden understanding of the implementation of air and space power. Topics of research are selected by the student and instructor to focus the student on a particular aspect of air and space power implementation during a particular campaign or conflict.
Prerequisite: Permission of UGST-AFROTC-Air Science.
Recommended: ARSC401 and ARSC400.

ARSC400 National Security and Preparation for Active Duty I (3 Credits)
Study of American national security policy and processes to include information and implementation, impact of major national and international actors, and development of major policy issues. This course will satisfy credit towards a minor in military studies.
Prerequisite: Permission of UGST-AFROTC-Air Science; or (ARSC300 or ARSC301).
Corequisite: ARSC059; or permission of UGST-AFROTC-Air Science.
Restriction: Senior standing.

ARSC401 National Security and Preparation for Active Duty II (3 Credits)
This course examines various subjects including: military law/justice, preparation for active duty, and current issues affecting military professionalism. This course will satisfy credit towards a minor in military studies.
Prerequisite: ARSC300 or ARSC301; or permission of UGST-AFROTC-Air Science.
Corequisite: ARSC059; or permission of UGST-AFROTC-Air Science.
Restriction: Senior standing.

ARTH - Art History & Archaeology

ARTH169 Special Topics in Study Abroad I (1-6 Credits)
Special topics course taken as part of an approved study abroad program.
Repeatable to: 15 credits if content differs.

ARTH200 Art and Society in Ancient and Medieval Europe and the Mediterranean (3 Credits)
Examines the material culture and visual expressions of Mediterranean and European societies from early times until ca. 1300 CE, emphasizing the political, social, and religious context of the works studied, the relationships of the works to the societies that created them, and the interrelationship of these societies.

ARTH201 Art and Society in the West from the Renaissance to the Present (3 Credits)
Examines representative European and American works of art from the later Middle Ages to the present, highlighting the dynamic exchange between artistic and cultural traditions both within periods and across time.

ARTH230 Symbolic Images: The Theory and Practice of Iconography in European Art, 1400-1850 (3 Credits)
Iconographic interpretation of visual narratives, signs and symbols has long been a topic of art-historical inquiry. In early modern European art, images were often conceived with the deliberate intent of posing a 'puzzle' or 'problem' for the beholder to solve; yet in most cases we have little or no evidence of how contemporary beholders solved such enigmas. Provides students with the opportunity to take command of these research methods and source materials, addressing a genuine iconographic problem, researching the relevant literature, identifying the essential primary source evidence, making contextually appropriate assumptions, and producing a valid result.

ARTH240 Humanists on the Move (3 Credits)
Introduces students to the practices of a field that is only about twenty years old: the Digital Humanities. We will explore how humanities scholars can reexamine their materials, configuring them as "data" that can be gathered and visualized in order to ask new questions about the past. Using traditional humanities source materials from this different perspective, students will produce entirely new data; using new digital platforms, they will create visualizations of that data; and using humanistic methods, they will interpret those visualizations. Focusing on the original Humanists from the Renaissance period, this course will teach students to engage closely with the most traditional materials of the humanities - primary texts produced in an historical period - and with the newest tools to work with humanities data. Students will complete two major projects by collecting data on the same humanist figures: mapping their travels, and tracing their networks. We will also consider how texts can be treated as data.

ARTH255 Art and Society in the Modern American World (3 Credits)
Explores the origins and evolution of art in the modern American world, from the late colonial era to the present, comparing major artistic movements and their historical contexts. Considers the diversity of art across Latin America and the United States, and the ways in which artworks mediate social, ethnic, political, and national identities.

ARTH260 Art and Activism (3 Credits)
Can art effect social change? How may we use the history of radical and avant-garde art to inform present-day movements and models of artistic and creative activism? This course explores the modern and contemporary history of political art and arts activism on local, national, and global scales.

ARTH261 Monuments, Monumentality, and the Art of Memorial (3 Credits)
Why do societies create monuments? And why do they preserve and destroy, change and remove them? How do monuments embody cultural values, shape historical narratives, and become sites of mourning and memory? This course investigates the political and cultural work of monuments across time and space, from the ancient world to European empires to the contemporary United States. The issues we consider include intercultural exchange and religious contexts, race and representation, and appropriation and iconoclasm.

ARTH262 Public Art (3 Credits)
How does public art function on a university campus, in major cities, and across the United States? This course invites students to empirically study the modern history and civic values of public art spanning sculpture, painting, mixed-media, and installation. We consider the nature of public space, the politics of representation and community, and the civic and memorial functions of art. The course is built around a semester-long project in which students will commission a work of public art for our College Park campus.

ARTH263 Art and Difference (3 Credits)
A comparative and thematic approach to studying the representation of otherness in art and visual culture from the eighteenth century to the present. Students will work to expand the definition of otherness, and consider the roles that ethnicity, nationality, and politics play in representations of otherness across various continents and chronologies.

ARTH265 How (and Why) to Look at Art in the Era of Climate Change (3 Credits)
How can art help us build the mindset necessary for fashioning a sustainable civilization? Paintings, photographs, films, novels, songs, and other creative works as they shape beliefs related to sustainability and justice.
Credit Only Granted for: ARTH265 or ARTH465.
Formerly: ARTH465.

ARTH269 Special Topics in Study Abroad II (1-6 Credits)
Special topics course taken as part of an approved study abroad program.
Repeatable to: 15 credits if content differs.
Additional Information: No more than 3 credits total of ARTH 269 or ARTH 289 can be used to satisfy the art history major requirement.

ARTH289 Special Topics in Art History and Archaeology (3 Credits)
Selected topics in the visual arts to introduce students to the history of various modes of visual expression and communication.
Repeatable to: 6 credits if content differs.
Additional Information: No more than 3 credits total of ARTH269 or ARTH289 can be used to satisfy the art history major requirement.

ARTH290 Art and Society in Asia (3 Credits)
A comparative, interrelational study of the different visual arts and material cultures produced by societies in Asia. An examination of the historical traditions and forms in political, social, and religious contexts.

ARTH292 Discovering Japan: How the Arts Shaped a Nation (3 Credits)
Explores the origins and creation of Japan from ancient to contemporary times through East Asian and European exchange. Acquaints students with painting, sculpture, architecture, ceramics, gardens, and other art forms in relation to the various cultural contexts within which they were produced and used.

ARTH300 Egyptian Art and Archaeology (3 Credits)
Sites and monuments of painting, sculpture, architecture, and the minor arts of ancient Egypt from earliest times through the Roman conquest. Emphasis on the pharaonic period.

ARTH301 Aegean Art and Archaeology (3 Credits)
Sites and monuments of painting, sculpture, architecture, and the minor arts of Crete, the Cycladic islands, and the Greek mainland from the earliest times to the downfall of the Mycenaean empire.

ARTH302 Greek Art and Archaeology (3 Credits)
Sites and monuments of painting, sculpture, architecture, and the minor arts from the Geometric through the Hellenistic period with emphasis on mainland Greece in the Archaic and Classical periods.

ARTH303 Roman Art and Archaeology (3 Credits)
Sites and monuments of painting, sculpture, architecture, and the minor arts from the earliest times through the third century A.D. with emphasis on the Italian peninsula from the Etruscan period through that of Imperial Rome.

ARTH305 Archaeological Methods and Practice (3 Credits)
A team-taught, interdisciplinary course discussing theories, methods, and ethical issues in the practice of archaeology.
Prerequisite: ANTH240, ARTH200, CLAS180, or CLAS190.
Cross-listed with: ANTH305, CLAS305, JWST319Y.
Credit Only Granted for: ANTH305, ARTH305, CLAS305, or JWST319Y.

ARTH313 Medieval Art: Cultural Exchanges in the Byzantine World (3 Credits)
Focuses on the art and architecture from the eastern Mediterranean, specifically, the Byzantine empire. Our broad focus will be on the formation and evolution of the visual arts in Byzantium as a result of exchanges with various cultural, ethnic, and religious entities and traditions. In this context, we will be looking at the legacy of the Graeco-Roman past, contacts with Islamic world, as well as with people and cultures along the periphery of Byzantium: from the Balkan peninsula, to Sicily and Russia.
Recommended: ARTH200 or ARTH201.

ARTH322 Van Eyck to Bruegel: The Renaissance in Northern Europe (3 Credits)
The tradition of pictorial art in the Netherlands from its flowering in the courts and cities of the early 15th century to the cataclysmic moment of iconoclasm in 1566. It will feature works by famous masters like Jan van Eyck, Hieronymus Bosch, Albrecht Durer, and Pieter Bruegel, but also objects created by lesser-known and anonymous makers. It will treat artworks -- illuminated books, tapestries, paintings, and printed images -- as complexly embedded in the great economic, social, and religious upheavals of this period, particularly considering the transition from feudalism to capitalism, the Reformation, and the sense of "discovery" of new worlds.

ARTH323 Fifteenth-Century Italian Renaissance Art (3 Credits)
Painting, sculpture, architecture, and the decorative arts of the fifteenth century in Italy.

ARTH324 Leonardo's World: Art and Experience in Renaissance Italy (3 Credits)
Painting, sculpture, architecture, and the decorative arts of the sixteenth century in Italy.

ARTH330 Seventeenth-Century European Art (3 Credits)
Painting, sculpture and architecture concentrating on Italy, Spain, France, and England.

ARTH335 Seventeenth-Century Art in the Netherlands (3 Credits)
Painting, sculpture and architecture in seventeenth-century Netherlands.

ARTH337 Cities and the Arts (3 Credits)
Cities and the Arts, as taught by different faculty members in the Department of Art History and Archaeology, will investigate the urban environment and visual culture(s) of one or several major centers. The class will consider how a large city's culture absorbs, transforms, and utilizes multiple external sources in developing a particular local brand defined as its "identity." It examines the visualization of ideals of local coherence as well as the arts of fragmentation and competing internal cultures. Cities and the Arts considers how a large city's interface with an expanding external world, even a global one, allows for appropriations and the rise of discrimi-nations; it examines how exclusions form within the city itself, and how social groups visually articulate identities that may run counter to the larger urban mythology.

ARTH350 Twentieth-Century Art to 1945 (3 Credits)
Painting, sculpture, and architecture in Europe and America from the late nineteenth century to the end of World War II.
Prerequisite: ARTH201.

ARTH351 Picturing Contemporary Life: Art Since 1945 (3 Credits)
Visual art since 1945, with an emphasis on North America and Europe.

ARTH357 History of Photography (3 Credits)
An exploration of the historical, social, aesthetic, and technological developments of the photographic medium and its relationship to other modes of visual representation in the creation of the modern world.
Credit Only Granted for: ARTH357 or ARTH457.

ARTH359 Film as Art (3 Credits)
The study of film as a visual art, from theoretical, cultural and aesthetic perspectives. Content varies by semester.
Repeatable to: 6 credits if content differs.

ARTH360 History of American Art to 1876 (3 Credits)
Painting, sculpture, architecture, and decorative arts in North America from the colonial period to 1876.

ARTH361 American Art from Civil War to Civil Rights (3 Credits)
Explores diverse artistic movements and makers in the United States, beginning at the end of the Civil War in 1865 and concluding with the art of Civil Rights era in the 20th century. We will ask how the visual arts construct and challenge formations of race, class, gender, and citizenship in the context of political transformations and social movements over a century of US history. This course emphasizes the practice of close looking as we encounter works art across a range of media--photography, painting, sculpture, film, material culture, performance art and public art.

ARTH362 Presently Black: Contemporary African American Art (3 Credits)
Looks critically at African-American and African diaspora art, focusing particularly on works made in the 20th and 21st centuries. Organized chronologically, this class will provide students with a more thorough understanding of this period of art, as well as the overall connection of visual material to the social, the political, and the aesthetic frames of its production. We will study the ways in which African-American visual production has been shaped by larger discourses about American art, but has also responded to the very real circumstances of racial exclusion in both the mainstream art world and larger society. Students will also have a chance to interact directly with the collection of the David C. Driskell Center throughout the semester.

ARTH369 Special Topics in Study Abroad III (1-6 Credits)
Special topics course taken as part of an approved study abroad program.
Repeatable to: 15 credits if content differs.
Additional Information: No more than 6 credits of ARTH 369 can be used to satisfy the art history major requirements.

ARTH370 Latin American Art and Archaeology before 1500 (3 Credits)
Pre-Hispanic painting, sculpture, and architecture, with a focus on the major archaeological monuments of Mexico.

ARTH372 Modern Latin American Art to 1945 (3 Credits)
Painting and sculpture in Latin America, with an emphasis on avant-garde movements in Mexico City, Havana, Buenos Aires, Sao Paulo, and Rio de Janeiro.

ARTH376 Living Art of Africa (3 Credits)
Art styles among the segmentary, centralized, and nomadic people of Africa. The iconography and function of their art and its relationship to their various societies, cults and ceremonies.

ARTH377 Global African Art (3 Credits)
A survey of the African-inflected arts around the world, focusing on such countries as Brazil, Haiti, Cuba and the United States

ARTH378 Special Topics for Honors Students (3 Credits)
Writing of a research paper. With an instructor's permission work may be done in conjunction with a graduate colloquium or seminar.
Prerequisite: Must be admitted to art history honors; and permission of ARHU-Art History & Archaeology department.
Restriction: Must be in Art History program.
Repeatable to: 6 credits.

ARTH383 Art of Japan after 1500 (3 Credits)
Thematically-focused topics in the painting, sculpture, architecture, gardens and decorative arts of early modern, modern and contemporary Japan, from 1500 to present.

ARTH385 Art of China (3 Credits)
A chronological survey of Chinese painting, sculpture, and the applied arts.

ARTH386 Experiential Learning (3-6 Credits)
Supervised internship experience in diverse areas of art historical, archaeological, and museological work.
Prerequisite: Permission of ARHU-Art History & Archaeology department.
Restriction: Junior standing or higher.

ARTH389 Special Topics in Art History and Archaeology (3 Credits)
Repeatable to: 6 credits if content differs.

ARTH391 Transnational Chinese Cinema (3 Credits)
Chinese cinema has made a big impact on contemporary world film culture. This course will introduce students to the films directed by some of the most representative filmmakers working in different geopolitical locations (mainland China, Taiwan, Hong Kong) and the Chinese diaspora. The films of these directors, in a spectrum of genres, themes, and styles, have inspired global scholarship, not only in visual culture and cinema, but also in the study of women's issues, gender and ethnic studies, as well as the fields of adaptation and intermedia studies. Students will explore these films in their socio-historical and artistic contexts, considering the influences and innovations that have shaped them and analyzing their reception by audiences and critics. After reading about the films they view, and participating in class discussions, students will be ready to complete their analytical written assignments, for which they will critically examine the films by applying key concepts such as gender, sexuality, race, gaze, style, representation, power, diaspora, etc.
Cross-listed with: CINE335.
Credit Only Granted for: ARTH391 or CINE335.

ARTH392 Contemporary Chinese Art and Film (3 Credits)
Contemporary Chinese art and film are arguably the most vibrant of all national arts at the turn of the millennium and have become the face - both figuratively and literally - of contemporary China, a complex society with historic overlays of Confucianism, Taoism, Buddhism, Communism, Post-socialism, and state capitalism. Students will consider a wide range of art forms (painting, photography, video, installation, web-based media, and film) in four broad themes (uses of the past; critiques of power; representations of race, gender, and sexuality; socially engaged art) and explore the complex intertwining of the political, historical, and aesthetic aspects in Chinese contemporary art and film, as well as the multiple contexts in which these artworks are created and circulated.
Cross-listed with: CINE337.
Credit Only Granted for: ARTH392, FILM329L or CINE337.
Formerly: FILM329L.

ARTH418 Special Problems in Italian Renaissance Art (3 Credits)
Focus upon aspects of painting, sculpture, and architecture of Renaissance.
Repeatable to: 6 credits if content differs.

ARTH426 Renaissance and Baroque Sculpture in Northern Europe (3 Credits)
Sculpture in France, Germany, England, and the Low Countries from the fourteenth to the seventeenth century.

ARTH472 Ecuador: Andean Spaces-Traversing the Colonial City and the Natural World (3 Credits)
Introduces students to the history and cultures of Ecuador from the colonial period to the beginning of the 19th century. By studying the socio-spatial configuration of the colonial city as exemplified by Quito, students will be immersed in the art, architecture, and other rich cultural legacies of Ecuador. Quito, a World Heritage site, offers students visually stunning churches, monasteries, colonial squares, a famed tradition of Baroque painting and sculptures, and vibrant indigenous and mestizo communities. As a contrast, students will explore also travel narratives that represent the natural Andean world while visiting Quito's surrounding areas. This course will interrogate the European influence on urban design and representations of the landscape of the Americas. Understanding this colonial past enhances the understanding of the modern history of the Andean region and Latin America as a whole. The students will gain a full appreciation of the European and Indigenous living heritage that composes the region today. Taught in English.
Cross-listed with: SPAN435.
Credit Only Granted for: SPAN435, SPAN448E, ARTH472 or ARTH369E.
Formerly: SPAN448E and ARTH369E.

ARTH484 Modern Chinese Film and Visual Culture (3 Credits)
Modern Chinese culture, society, and history studied through examples of art, film, and visual culture.
Cross-listed with: CINE426.
Credit Only Granted for: ARTH484, CINE426 or FILM426.
Formerly: FILM426.

ARTH488 Colloquium in Art History (3 Credits)
Colloquium to investigate a specific topic in depth.
Prerequisite: Permission of ARHU-Art History & Archaeology department.
Repeatable to: 9 credits if content differs.

ARTH489 Special Topics in Art History (3 Credits)
Prerequisite: Permission of ARHU-Art History & Archaeology department.
Repeatable to: 9 credits if content differs.

ARTH498 Directed Studies in Art History I (2-3 Credits)
Prerequisite: Permission of ARHU-Art History & Archaeology department.
Restriction: Junior standing or higher.
Repeatable to: 99 credits if content differs.

ARTH499 Honors Thesis (1-6 Credits)
Prerequisite: Permission of ARHU-Art History & Archaeology department.
Repeatable to: 6 credits if content differs.

ARTT - Art Studio

ARTT100 Two-Dimensional Design Fundamentals (3 Credits)
Principles and elements of two-dimensional design. Introduction to visual communication.

ARTT110 Elements of Drawing I (3 Credits)
Fundamental concepts, media, and processes of drawing. Emphasis on observation and representation in combination with individual expression. Subject matter includes still life, human figure, nature, the built environment, and conceptual projects.

ARTT150 Introduction to Art Theory (3 Credits)
Fundamental concepts of global, philosophic, and critical art theory examined through various historic and contemporary texts, and the analysis of works of art.

ARTT169 Special Topics in Study Abroad I (1-6 Credits)
Special topics course taken as part of an approved study abroad program.
Repeatable to: 15 credits if content differs.

ARTT200 Three-Dimensional Art Fundamentals (3 Credits)
Fundamental concepts of three-dimensional form and space examined through the manipulation and organization of various materials.
Prerequisite: ARTT100 and ARTT110.

ARTT208 Intermediate Special Topics in Art (3 Credits)
Intermediate special topics in Art.
Repeatable to: 6 credits if content differs.

ARTT210 Elements of Drawing II (3 Credits)
Continuation of ARTT110 with additional emphasis on color, figure drawing, and contemporary issues.
Prerequisite: ARTT110.

ARTT255 Introduction to Digital Art and Design Processes (3 Credits)
Introduction to basic software and principles of digital imaging, and how they are applied to art and design. Topics covered: Digital image construction and manipulation, Vector-Based digital techniques layout, typography, etc), time-based digital techniques (video and audio composition and manipulation), and basic interactivity (web-design). Digital media used to explore visual principles established in ARTT100.
Prerequisite: ARTT100 and ARTT110.
Credit Only Granted for: ARTT255 or ARTT354.
Formerly: ARTT354.

ARTT260 Dangerous Art: Censorship or Subsidy (3 Credits)
Combines a broad historical analysis of the relationship between art and authority with an examination of contemporary culture criticism and art practice. Explores the uses and abuses of art and culture in totalitarianand theocratic states as a prelude to a review of the role of official culture in the United States. Examines art and culture in the public arena and many related areas where the arts and policy interact.

ARTT269 Special Topics in Study Abroad II (1-6 Credits)
Special topics course taken as part of an approved study abroad program.
Repeatable to: 15 credits if content differs.

ARTT320 Elements of Painting (3 Credits)
Concepts and fundamental processes of oil and/or acrylic painting.
Prerequisite: ARTT200, ARTT210, and ARTT150; or permission of ARHU-Art department.

ARTT330 Elements of Sculpture: Metal Casting (3 Credits)
Sculptural concepts and fundamental processes related to metal casting.
Prerequisite: ARTT200, ARTT210, and ARTT150; or permission of ARHU-Art department.

ARTT331 Elements of Sculpture: Steel (3 Credits)
Sculptural concepts and fundamental processes related to steel fabrication; torch cutting, welding, hot forging, and finishing.
Prerequisite: ARTT200, ARTT210, and ARTT150; or permission of ARHU-Art department.

ARTT333 Elements of Sculpture: Wood and Mixed Media (3 Credits)
Sculptural concepts and fundamental processes using wood and mixed media.
Prerequisite: ARTT200, ARTT210, and ARTT150; or permission of ARHU-Art department.

ARTT341 Elements of Printmaking: Woodcut and Relief (3 Credits)
Concepts and fundamental processes related to woodcuts, linocuts, and other relief printing media.
Prerequisite: ARTT200, ARTT210, and ARTT150; or permission of ARHU-Art department.

ARTT343 Elements of Printmaking: Screen Printing (3 Credits)
Concepts and fundamental processes related to silkscreen printing.
Prerequisite: ARTT200, ARTT210, and ARTT150; or permission of ARHU-Art department.

ARTT353 Elements of Photography (3 Credits)
Introduction to digital photographic image-making. With an emphasis on technical, aesthetic and conceptual understanding of the photographic medium, camera operation, and photographic composition. Students must have access to a Digital SLR or mirrorless camera capable of interchangeable lenses for this class.
Prerequisite: ARTT200, ARTT210, and ARTT150; or permission of ARHU-Art department.

ARTT355 Intermediate Graphic Design Principles (3 Credits)
Investigation of basic concepts, history, techniques, and materials used by professional graphic designers, focusing on typography. Explores various aspects of design related to typography through examination and production of many types of finished work.
Prerequisite: ARTT150, ARTT200, ARTT210, and ARTT255; and must be admitted to the Graphic Design Concentration (Track 3).
Credit Only Granted for: ARTT350 or ARTT355.
Formerly: ARTT350.

ARTT356 Graphic Design Processes (3 Credits)
Explores computer graphics and visual communcation principles in a time-based context. Examination of fundamental design principles through digital projects that involve photo manipulation, digital illustration, layout, animation, and web design.
Prerequisite: ARTT150, ARTT200, ARTT210, and ARTT255; and must have been admitted to Graphic Design Concentration (Track 3).
Credit Only Granted for: ARTT351 or ARTT356.
Formerly: ARTT351.

ARTT357 Interactive Design (3 Credits)
In-depth exploration of interactive design and website construction. Emphasis on concept-driven and community-based projects using variety of interactive software programs.
Prerequisite: ARTT355 and ARTT356.

ARTT361 Design Literacy: Decoding Our Visual Culture (3 Credits)
Holistic presentation of design history and theory from pre-history to present. Covers primarily visual communication design and includes the interrelationship of interior-, furniture-, industrial-, fashion-design, and architecture.
Prerequisite: ARTT355 and ARTT356.
Credit Only Granted for: ARTT361 or ARTT489L.
Formerly: ARTT489L.

ARTT369 Special Topics in Study Abroad III (1-6 Credits)
Special topics course taken as part of an approved study abroad program.
Repeatable to: 15 credits if content differs.

ARTT370 Elements of Digital Media (3 Credits)
Exploration of image creation and manipulation, interactivity, and linkages between digital audio and video. Emphasis on issues in contemporary digital art.
Prerequisite: ARTT150, ARTT200, ARTT210, and ARTT255; or permission of ARHU-Art department.

ARTT386 Experiential Learning (3-6 Credits)
Prerequisite: Permission of ARHU-Art department.
Restriction: Junior standing or higher.

ARTT389 Department of Art Undergraduate Teaching Assistantship (3 Credits)
Individual contractual agreement with faculty/mentor. Individualized assistantship in the teaching of a specified department course offering. Must have previously received an "A" grade for the class to be assisting.
Prerequisite: Permission of ARHU-Art department.
Repeatable to: 6 credits if content differs.

ARTT399 Department of Art Research Assistantship (1-3 Credits)
Individual contractual agreement with faculty/mentor. Individualized experiential learning developed in relation to art-related research issues.
Prerequisite: Permission of ARHU-Art department.
Repeatable to: 6 credits if content differs.

ARTT409 Study Abroad Special Topics IV (1-6 Credits)
Special topics course taken as part of an approved study abroad program.
Repeatable to: 15 credits if content differs.

ARTT418 Advanced Drawing Studio (3 Credits)
Multi-level drawing studio emphasizing advanced concepts and processes related to drawing; emphasis on contemporary art issues and individual directions.
Prerequisite: ARTT200, ARTT210, and ARTT150; and must have completed one 300-level studio course. Or permission of ARHU-Art department.
Repeatable to: 12 credits.

ARTT426 Advanced Painting: Painting on Site I (3 Credits)
Designed for Art and design, architecture, urban planning, and public engagement majors seeking to gain more experience in the public art process. Through public artworks, students will explore ethical methods of community engagement, mural design and production. This course will have 1-2 visiting artists give lectures and/or participate in a workshop.
Prerequisite: ARTT320; or permission of the Art Department.

ARTT427 Advanced Painting: Painting on Site II (3 Credits)
Designed for Art and design, architecture, urban planning, and public engagement majors and Creative Placemaking minors seeking to build and strengthen relationships through public place-based artwork . This course will teach ethical methods of public outreach through community engagement, the stages of mural design, and research to aid the mural design phase. This course will also examine the various materials used to create a public work of art and apply them throughout the semester effectively.
Prerequisite: ARTT320.
Restriction: Permission of the Art Department.

ARTT428 Advanced Painting Studio (3 Credits)
Multi-level painting studio emphasizing advanced concepts and processes related to oil and acrylic painting; emphasis on contemporary art issues and individual directions in chosen media.
Prerequisite: ARTT320.
Repeatable to: 12 credits.

ARTT438 Advanced Sculpture Studio (3 Credits)
Multi-level sculpture studio; continuation of media-specific sculpture courses with emphasis on contemporary art issues and individual directions in chosen media.
Prerequisite: Must have completed one 300-level sculpture course; or permission of ARHU-Art department.
Repeatable to: 12 credits.

ARTT448 Advanced Printmaking Studio (3 Credits)
Multi-level printmaking studio; continuation of media-specific printmaking courses with emphasis on contemporary art issues and individual directions in chosen media.
Prerequisite: Must have one 300-level printmaking course; or permission of ARHU-Art department.
Repeatable to: 12 credits.

ARTT449 Advanced Photography Studio (3 Credits)
Advanced photographic processes and theory. Emphasis on contemporary art issues and individual directions.
Prerequisite: ARTT353; or permission of ARHU-Art department.
Repeatable to: 12 credits if content differs.

ARTT454 Advanced Graphic Design Principles: Design in Society (3 Credits)
Focus on social responsibility and community activism. History and theory of propaganda and advocacy-based design. Students explore current design practices, work individually, and collaborate in teams with non-profits or other clients with community-based or socio-cultural agendas. Research and writing-intensive course.
Prerequisite: ARTT355 and ARTT356.

ARTT455 Three Dimensional Graphic Design (3 Credits)
Continued exploration of advanced graphic design practices with primary emphasis on 3-D object and packaging design. Includes research, course reading discussion, oral presentations, and specific project assignments which will require a proficient level of hand-skills (craft) and computer skills.
Prerequisite: ARTT355, ARTT356, and ARTT357.
Recommended: ARTT333.
Credit Only Granted for: ARTT352 or ARTT455.
Formerly: ARTT352.

ARTT456 Motion Design (3 Credits)
Explores computer graphics and visual communication principles in a time-based context. Examination of fundamental design principles through digital projects that involve photo manipulation, digital illustration, layout, animation, and web design.
Prerequisite: ARTT355, ARTT356, and ARTT357; or permission of ARHU-Art department.

ARTT457 Advanced Interactive Design (3 Credits)
Advanced concepts and techniques of interactive design and interactive software. Examination of corporate, client-based, and public service-based interactive graphic design. Emphasis on web-based interactive design structures.
Prerequisite: ARTT357.

ARTT458 Graphic Design Portfolio (3 Credits)
Creation of a comprehensive professional portfolio. Curriculum includes portfolio preparation and presentation, contracts, copyright issues, interviewing skills, resume and cover-letter writing, design briefs and proposals, and freelance business issues. Portfolio presentation includes basics of book arts.
Prerequisite: ARTT454.
Repeatable to: 9 credits if content differs.

ARTT459 Advanced Graphic Design Studio (3 Credits)
Student-run design firm working with non-profits and other organizations. Organizations act as clients; the students as a creative firm. Under guidance and supervision of faculty, students learn first-hand about working with clients, working within a budget, working with printers and press runs, and working under real deadlines.
Prerequisite: ARTT454; or permission of ARHU-Art department.
Repeatable to: 9 credits if content differs.

ARTT460 Seminar in Art Theory (3 Credits)
Exploration of relationship between content and processes of art in a contemporary multi-cultural context.
Restriction: Senior standing.

ARTT468 Seminar on the Interrelationship Between Art and Art Theory (3 Credits)
The relationship between a student's work and the theoretical context of contemporary art.
Restriction: Junior standing or higher; or permission of ARHU-Art department.
Repeatable to: 6 credits if content differs.

ARTT469 Professional Practice (3 Credits)
Business aspects of being an artist, with an emphasis on starting and maintaining a professional career.
Restriction: Senior standing; or permission of ARHU-Art department.
Repeatable to: 6 credits if content differs.
Formerly: ARTT462.

ARTT479 Advanced Digital Media Studio (3 Credits)
Variable multi-level studio emphasizing advanced concepts and processes related to time-based, projection, installation, interactive, and audio/visual integrated digital art. Emphasis on contemporary art issues and individual directions.
Prerequisite: ARTT370; or permission of ARHU-Art department.
Repeatable to: 12 credits if content differs.

ARTT481 Advanced Specialization Seminar (3 Credits)
Seminar combines contemporary art theory, criticism, professional practice and career preparation in relation to students works from all areas of specialization.
Prerequisite: Permission of ARHU-Art department.

ARTT487 Capstone for Citation in Interdisciplinary Multimedia and Technology (1 Credit)
Independent study: a paper or website synthesizing the various citation learning experiences.
Prerequisite: Permission of ARHU-Art department.

ARTT488 Advanced Special Topics in Graphic Design (1-3 Credits)
Variable topics in Graphic Design theory and practice.
Prerequisite: Permission of ARHU-Art department.
Repeatable to: 6 credits if content differs.

ARTT489 Advanced Special Topics in Art (1-3 Credits)
Advanced studio art and theory within the context of a special topic.
Prerequisite: Permission of ARHU-Art department.
Repeatable to: 12 credits if content differs.

ARTT498 Directed Studies in Studio Art (1-3 Credits)
Advanced independent work in Studio Art. Meeting with faculty and studio time arranged.
Prerequisite: Permission of ARHU-Art department.
Repeatable to: 12 credits if content differs.

ARTT499 Directed Studies in Graphic Design (1-3 Credits)
Advanced independent studies in Graphic Design. Meetings with faculty and studio time arranged.
Prerequisite: Permission of ARHU-Art department.
Repeatable to: 12 credits if content differs.

ARTX - Art Studio Education Abroad

ARTX201 Historic Artistic Techniques (1 Credit)
This intensive one-credit course introduces students to the materials and techniques of the past through a practical workshop. The course also introduces the history of the ancient technique, with examples from Rome and the Mediterranean world. Techniques for the conservation and restoration of mosaics will also be covered through relevant case-studies.
Additional Information: This course is offered as part of the Maryland-in-Rome study abroad program. Students must apply for this program through Education Abroad: More information at ter.ps/UMRome. Education Abroad processes registrations for this course on behalf of students.

ARTX202 The Making of Art: History of Art Material (3 Credits)
Introduces students to the history of artistic media through practical examples, focusing on the history of painting, sculpture, prints, and drawings as media. Practical classes will take place in the studio and on-site in museums and churches in Rome and in the classroom.
Additional Information: This course is offered as part of the Maryland-in-Rome study abroad program. Students must apply for this program through Education Abroad: More information at ter.ps/UMRome. Education Abroad processes registrations for this course on behalf of students.

ARTX203 Photo Documentary and Discovery (3 Credits)
In this course, you learn to research and tell your individual story through photography. Utilizing workshops and excursions outside the classroom, you develop the skills to dive into different cultures and use your camera as a medium for understanding a community and telling your story through photographs.
Additional Information: This course is offered as part of the Maryland-in-Stockholm study abroad program. Students must apply for this program through Education Abroad: More information at ter.ps/UMStockholm. Education Abroad processes registrations for this course on behalf of students.

ARTX204 Ways of Seeing: Storytelling Through Photography (3 Credits)
This class is an effort to make sense of your study abroad stay: rather than creating photographs as mementos, you will make pictures that are unique to your stay in Stockholm, but still refer back to your life in general. This class combines a studio critique and a survey of the history and theory of photography.
Additional Information: This course is offered as part of the Maryland-in-Stockholm study abroad program. Students must apply for this program through Education Abroad: More information at ter.ps/UMStockholm. Education Abroad processes registrations for this course on behalf of students.

ARTX301 Painting Workshop (3 Credits)
This is an advanced course in painting techniques, which may include other media, such as photography and printmaking as research aids. Students will further develop and explore personal concepts in the painting medium to produce a coherent body of work.
Additional Information: This course is offered as part of the Maryland-in-Rome study abroad program. Students must apply for this program through Education Abroad: More information at ter.ps/UMRome. Education Abroad processes registrations for this course on behalf of students.

ARTX302 Printmaking Workshop (3 Credits)
This is an advanced course in printmaking techniques. Students will further develop and explore personal concepts in the printmaking medium to produce a coherent body of work.
Additional Information: This course is offered as part of the Maryland-in-Rome study abroad program. Students must apply for this program through Education Abroad: More information at ter.ps/UMRome. Education Abroad processes registrations for this course on behalf of students.

ARUX - Arts and Humanities Education Abroad

ARUX301 Tour Guiding & Multicultural Competence (Community Engagement Practicum) (3 Credits)
Develops student competencies in mediating between cultures and professional tour guiding through working as tour guides in one of the main churches in Florence. Students attend a seminar alongside their tour guiding to promote their understanding of the cultural and religious importance of the main Florentine churches and the fundamental importance of these monuments for Italian national identity and Florentine local identity.
Additional Information: This course is offered as part of the Maryland-in-Florence study abroad program. Students must apply for this program through Education Abroad: More information at ter.ps/UMFlorence. Education Abroad processes registrations for this course on behalf of students.

ARUX302 Global Internship Course (3 Credits)
Engages students in an internship and living abroad experience and supports them through academic mentoring and on-line sessions to further develop their personal and professional skills as they earn academic credit. Students participate in a variety of out-of-class guided and self-guided activities and excursions, and move through the course's three main themes of Personal and Professional Development, Intercultural Competence, and Comparative Analysis of their host location in relation to the USA.
Additional Information: This course is offered as part of the Arts & Humanities-in-London study abroad program. Students must apply for this program through Education Abroad: More information at https://globalmaryland.umd.edu/offices/education-abroad/program/11854. Education Abroad processes registrations for this course on behalf of students.

ARUX303 Discovering Abilities: Narratives, Disabilities, and Identities (Cultural Engagement Practicum) (3 Credits)
Students work with intellectual disabilities within local social enterprise institutions, such as a restaurant or shop. These associations help individuals with sensorial and/or intellectual disabilities integrate into a real work environment. While these are inclusive institutions aimed at people with disabilities, they are real businesses that have to turn a profit in order to survive. Students volunteering for this practicum will be helping staff in a practical way, but also learn how to relate to people with disabilities and observe how people with disabilities deal with the challenges of a real enterprise.
Additional Information: This course is offered as part of the Maryland-in-Florence study abroad program. Students must apply for this program through Education Abroad: More information at ter.ps/UMFlorence. Education Abroad processes registrations for this course on behalf of students.

ASTR - Astronomy

ASTR100 Introduction to Astronomy (3 Credits)
Take a tour of the universe! This course wanders through the night sky, learning about phases of the Moon and eclipses, and then stops by the different planets, moons, and small bodies within our solar system. After that, it's on to bigger things, with stops by the Sun and other stars, learning about how they live and die - possibly in supernovae! - before exploring the weird objects left behind, such as neutron stars and black holes. All of these objects are within our galaxy, the Milky Way, which is one of uncountable galaxies in the universe! A tour wouldn't be complete without thinking about where it all came from: the Big Bang. This course is for non-Astronomy majors and is mostly descriptive with some algebra and trigonometry.
Credit Only Granted for: ASTR100, ASTR101, or ASTR120.

ASTR101 General Astronomy (4 Credits)
Descriptive astronomy, appropriate for non-science majors. Sun, moon, planets, stars, nebulae, galaxies and evolution. Laboratory exercises include use of photographic material, computer simulations, and standard laboratory equipment.
Credit Only Granted for: ASTR100, ASTR101, or ASTR120.

ASTR120 Introductory Astrophysics - Solar System (3 Credits)
For students majoring in astronomy or with a strong interest in science. Topics include development of astronomy, planetary orbits, electromagnetic radiation, telescopes as well as constituents and origin of the solar system (planets, satellites, comets, asteroids, meteoroids, etc.).
Prerequisite: Must have completed or be concurrently enrolled in MATH140.
Restriction: Must not have completed ASTR101 or ASTR100.
Credit Only Granted for: ASTR100, ASTR101, or ASTR120.

ASTR121 Introductory Astrophysics II - Stars and Beyond (4 Credits)
For students majoring in astronomy or with a strong interest in science. Includes instrumentation, stellar properties, stellar evolution, structure of the galaxy, other galaxies, large scale structure, Big Bang Theory, and future of the universe.
Prerequisite: ASTR120 and MATH140; or permission of CMNS-Astronomy department.
Restriction: Must be in Astronomy program; or permission of CMNS-Astronomy department.

ASTR130 Introductory Astrophysics 1 - Foundations (3 Credits)
First course in a three-course sequence for students planning to major in Astronomy. Celestial coordinate systems, seasonal astronomy, orbital motion, electromagnetic spectrum, magnitudes. Emphasis on mathematical preparation and rigor in preparation for successive courses.
Prerequisite: Must have completed or be concurrently enrolled in MATH115.
Credit Only Granted for: ASTR130 or ASTR120.

ASTR131 Introductory Astrophysics 2 - Planets and Stars (3 Credits)
Second course in a three-course sequence for students planning to major in Astronomy. Conservation laws; terrestrial planet geology, surfaces, and atmospheres; jovian planets; small bodies; solar structure and activity; stellar characteristics; variable stars; exoplanets; solar system formation.
Prerequisite: ASTR130; and must have completed or be concurrently enrolled in MATH140.
Restriction: Must be in CMNS- Astronomy program.
Credit Only Granted for: ASTR131 or ASTR120.

ASTR220 Collisions in Space - The Threat of Asteroid Impacts (3 Credits)
Should we defend our planet against potential asteroid impacts? Collisions in Space will evaluate the threat of asteroid impacts with the Earth using knowledge of asteroid characteristics and orbits. The merits of possible defense plans will be discussed, as well as the budgetary and political concerns associated with implementing any such plan. Appropriate for non-science majors.
Restriction: Must not be in the Astronomy major.

ASTR230 The Science and Fiction of Planetary Systems (3 Credits)
Have you ever wondered if humans will ever terraform Mars or Europa so we could live there without a spacesuit? Has it ever crossed your mind how lucky you are that you live on a water-rich planet with an oxygen-rich atmosphere? Have you ever suspected novelists and scriptwriters of creating ridiculous planets that violate scientific laws? Does the fate of our planet's thin biosphere keep you up at night? How common is life in the Universe? These are difficult questions, but armed with the right information, you can answer all of them. The Science and Fiction of Planetary Systems will help you develop a deeper understanding of why planets are the way they are. Along the way, you'll see examples of mistakes made in classic science fiction movies, novels and short stories and get the chance to invent your own plausible planets!
Prerequisite: Must have math eligibility of MATH115 or higher; or MATH113.

ASTR232 Introductory Astrophysics 3 - The Milky Way and Beyond (4 Credits)
Third course in a three-course sequence for students planning to major in Astronomy. The Milky Way, other galaxies, the cosmic distance ladder, AGN, dark matter, cosmology. Required lab section emphasizes analytical and programming skills.
Prerequisite: ASTR131 and MATH140.
Restriction: Must be in CMNS-Astronomy program.
Credit Only Granted for: ASTR232 or ASTR121.

ASTR288 Special Projects in Astronomy (1-3 Credits)
Independent study, short research projects, tutorial reading, and assisting with faculty research and teaching under special supervision.
Prerequisite: Permission of CMNS-Astronomy department.
Repeatable to: 6 credits.

ASTR300 Stars and Stellar Systems (3 Credits)
Designed primarily for non-science majors. Study of stars-types, properties, evolution, and distribution in space; supernovae, pulsars, and black holes.
Prerequisite: ASTR100 or ASTR101; and completion of the CORE Distributive Studies requirement in Mathematics and Sciences or General Education Fundamental Studies requirement in Mathematics. Or permission of CMNS-Astronomy department.

ASTR310 Observational Astronomy (4 Credits)
Introduction to current optical observational techniques, with brief coverage of infrared, ultraviolet, and x-ray techniques. Statistics, spherical trigonometry time, catalogs, geometrical and physical optics, telescopes, and optical instruments. Effects of the atmosphere. Practical work at the observatory using a CCD camera. Some nighttime observing sessions.
Prerequisite: ASTR232, PHYS171 and PHYS265.
Restriction: Must be in CMNS-Astronomy program.

ASTR315 Astronomy in Practice (4 Credits)
Students learn astronomy research techniques and contribute significantly to the existing body of astronomical knowledge. Students apply methods and tools such as celestial coordinates, telescopes and CCD cameras, and appropriate analysis software to a specific observational goal. Students produce a work detailing their scientific result which will be submitted for publication in a professional venue. Each semester, the course focuses on a specific astronomical topic or type of object, such as asteroids, extrasolar planets, supernovae in other galaxies, quasars, etc.
Restriction: Must not be in Astronomy program.
Additional Information: Appropriate for non-science majors.

ASTR320 Theoretical Astrophysics (3 Credits)
Application of selected physics concepts in an astrophysical context. Topics would include gravity (Keplerian motion, Virial theorem, Roche limit, dynamical friction); gas dynamics (hydrostatic equilibrium, stellar models, spiral density waves), thermodynamics and statistical physics (Boltzmann distribution, Wien displacement, convective instability, degenerate gas); atomic physics (quantum principles, H atom, permitted and forbidden lines); radiation processes (line radiation, opacity).
Prerequisite: ASTR232 and PHYS273.
Restriction: Must be in CMNS-Astronomy program.

ASTR330 Solar System Astronomy (3 Credits)
Designed primarily for non-science majors. The structure of planets and of their atmospheres, the nature of comets, asteroids, and satellites. Comparison of various theories for the origin of the solar system. Emphasis on a description of recent data and interpretation.
Prerequisite: ASTR100 or ASTR101; and completion of the CORE Distributive Studies requirement in Mathematics and Sciences or the General Education Fundamental Studies requirement in Mathematics. Or permission of CMNS-Astronomy department.
Credit Only Granted for: ASTR330 or GEOL212.

ASTR340 Origin of the Universe (3 Credits)
Designed primarily for non-science majors. A study of our progression of knowledge about the universe. Topics include: early cosmological models, geocentric vs. heliocentric theory, curvature of space, Hubble's Law, Big Bang Theory, microwave background radiation, evolution of stars and galaxies, dark matter, active galaxies, quasars and the future of the universe.
Prerequisite: ASTR100 or ASTR101; and completion of the CORE Distributive Studies requirement in Mathematics and Sciences or General Education Fundamental Studies requirement in Mathematics. Or permission of CMNS-Astronomy department.

ASTR350 Black Holes (3 Credits)
Black holes are the most exotic prediction of Einstein's Theory of General Relativity and, amazingly, the Universe seems to manufacture these bizarre objects in copious numbers. As well as being the ultimate laboratory for studying the nature of space and time, they drive some of the most energetic and extreme phenomena known to astronomers (with quasars and gamma-ray bursts being just a couple of examples). In this introduction to the physics and astrophysics of black holes, we start by examining the basic physics of black holes, which fundamentally means understanding gravity. We then look at the nature of stellar-mass black holes and supermassive black holes. We will discuss the fairly recent realization that black holes may be crucial agents for regulating the growth of galaxies. Finally, we dive into the realm of theoretical physics and probe how black holes may provide a route for uncovering new laws of physics governing the structure of space and time.
Prerequisite: ASTR100 or ASTR101; and completion of the CORE Distributive Studies requirement in Mathematics and Sciences or General Education Fundamental Studies requirement in Mathematics. Or permission of CMNS-Astronomy department.
Credit Only Granted for: ASTR398B or ASTR350.
Formerly: ASTR398B.

ASTR380 Life in the Universe - Astrobiology (3 Credits)
Designed primarily for non-science majors. Study of the astronomical perspective on the conditions for the origin and existence of life in the universe.

ASTR386 Experiential Learning (1-3 Credits)
Restriction: Junior standing or higher; and permission of CMNS-Astronomy department.

ASTR398 Special Topics in Astronomy (3 Credits)
This course is designed primarily for students not majoring in astronomy and is suitable for nonscience students. It will concentrate study in some limited field in astronomy which will vary from semester to semester. Possible subjects for study are the solar system, extragalactic astronomy and cosmology, the inconstant universe.
Restriction: Junior standing or higher; or permission of CMNS-Astronomy department.
Repeatable to: 6 credits if content differs.

ASTR399 Honors Seminar (1-16 Credits)
Credit according to work done.
Restriction: Must be admitted to the departmental honors program in astronomy.

ASTR406 Stellar Structure and Evolution (3 Credits)
Study of stellar internal structure, nuclear reactions, and energy transport. Study of stellar evolution of both low-mass and high-mass stars, including the stellar end states of white dwarfs, neutron stars, and black holes.
Prerequisite: ASTR320; or permission of CMNS-Astronomy department.
Credit Only Granted for: ASTR498N or ASTR406.
Formerly: ASTR498N.

ASTR410 Radio Astronomy (3 Credits)
Introduction to current observational techniques in radio astronomy. The radio sky, radiophysics, coordinates and catalogs, antenna theory, Fourier transforms, interferometry and arrays, aperture synthesis, and radio detectors.
Prerequisite: ASTR232 and PHYS273.

ASTR415 Computational Astrophysics (3 Credits)
Introduction to the most important computational techniques being used in research in astrophysics. Topics include modern high performance computer architectures, scientific visualization and data analysis, and detailed descriptions of numerical algorithms for the solution to a wide range of mathematical systems important in astrophysics.
Prerequisite: ASTR232 and PHYS273.
Jointly offered with: ASTR615.
Credit Only Granted for: ASTR415 or ASTR615.

ASTR421 Galaxies (3 Credits)
Introduction to structure, kinematics, and dynamics of normal and peculiar galaxies. Quantitative descriptions of normal spiral galaxies (like our Milky Way) and elliptical galaxies will be followed by more exotic considerations such as interacting and merging galaxies, and active galactic nuclei.
Prerequisite: ASTR232 and PHYS273.

ASTR422 Cosmology (3 Credits)
Introduction to modern cosmology. Topics include large scale structure of universe, the intergalactic medium, the nature of dark matter cosmological models and galaxy formation.
Prerequisite: Must have completed or be concurrently enrolled in ASTR320; or permission of CMNS-Astronomy department.

ASTR430 The Solar System (3 Credits)
Formation and evolution of the Solar System. Planetary surfaces, interiors, atmospheres, and magnetospheres. Asteroids, comets, planetary satellites, and ring systems. Emphasis on using basic physics to understand observed properties of the Solar System. Intended for students majoring in the physical sciences.
Prerequisite: ASTR232; and PHYS273.

ASTR435 Astrophysics of Exoplanets (3 Credits)
Introduction to exoplanets. Topics include historical development, advantages, and limitations of detection methods, the statistics of exoplanet characteristics, the bulk properties of known expolanets, and remote sensing for characterization of exoplanets.
Prerequisite: ASTR232; and PHYS273.

ASTR450 Orbital Dynamics (3 Credits)
Vectorial mechanics, motion in a central force field, gravitational and non-gravitational forces, the two-body and three-body problems, orbital elements and orbital perturbation theory, resonances in the solar system, chaos. Intended for students majoring in any of the physical sciences.
Prerequisite: Must have completed or be concurrently enrolled in ASTR320; or permission of CMNS-Astronomy department.

ASTR480 High Energy Astrophysics (3 Credits)
The structure, formation, and astrophysics of compact objects, such as white dwarfs, neutron stars, and black holes, are examined. Phenomena such as supernovae and high-energy particles are also covered.
Prerequisite: Must have completed or be concurrently enrolled in ASTR320; or permission of CMNS-Astronomy department.

ASTR498 Special Problems in Astronomy (1-6 Credits)
Research or special study. Credit according to work done.
Restriction: Must be in one of the following programs (Physics; Astronomy) ; and permission of CMNS-Astronomy department.

BCHM - Biochemistry

BCHM386 Experiential Learning (3-6 Credits)
Restriction: Junior standing or higher; and must have a learning proposal approved by the Office of Experiential Learning Programs, faculty sponsor, and student's internship sponsor.

BCHM461 Biochemistry I (3 Credits)
First semester of a comprehensive introduction to modern biochemistry. Structure, chemical properties, and function of proteins and enzymes, carbohydrates, lipids, and nucleic acids. Basic enzyme kinetics and catalytic mechanisms.
Prerequisite: Minimum grade of C- in CHEM271 and CHEM272; or minimum grade of C- in CHEM276 and CHEM277; and minimum grade of C- in (CHEM241 and CHEM242) or CHEM247.
Credit Only Granted for: BCHM461 or BCHM463.

BCHM462 Biochemistry II (3 Credits)
A continuation of BCHM 461. Metabolic pathways and metabolic regulation, energy transduction in biological systems, enzyme catalytic mechanisms.
Prerequisite: Minimum grade of C- in BCHM461.
Credit Only Granted for: BCHM462 or BCHM463.

BCHM463 Biochemistry of Physiology (3 Credits)
A one-semester introduction to general biochemistry. A study of protein structure, enzyme catalysis, metabolism, and metabolic regulation with respect to their relationship to physiology.
Prerequisite: Minimum grade of C- in CHEM271 and CHEM272; or minimum grade of C- in CHEM276 and CHEM277; and minimum grade of C- in (CHEM241 and CHEM242) or CHEM247.
Credit Only Granted for: BCHM461, BCHM462 or BCHM463.

BCHM464 Biochemistry Laboratory (3 Credits)
Biochemical and genetic methods for studying protein function. Site-directed mutagenesis and molecular cloning, protein purification, enzyme activity assays, computer modeling of protein structure.
Prerequisite: BCHM461 or BCHM463; and a grade of C- or better in the prerequisite is required for all College of Computer, Mathematical, and Natural Sciences majors and recommended for all students.
Corequisite: BCHM465.
Restriction: BCHM, CHEM, and Nutritional Sciences majors have first priority, followed by other life science majors.

BCHM465 Biochemistry III (3 Credits)
CORE Capstone (CS) Course. An advanced course in biochemistry. Biochemical approach to cellular information processing. DNA and RNA structure. DNA replication, transcription, and repair. Translation of mRNA to make proteins.
Prerequisite: BCHM461 or BCHM463; and a grade of C- or better in the prerequisite is required for College of Computer, Mathematical, and Natural Sciences majors and recommended for all students.
Recommended: BCHM462.

BCHM477 Biomolecular Measurement and Data Analysis (3 Credits)
Covers a range of classic and modern biochemical assays and techniques as well as introducing data science approaches to "omics" data. Upon successful completion of this course, students should have the necessary preparation and experience to collaborate productively with research scientists in industrial, clinical or academic contexts.
Prerequisite: CHEM271 or CHEM276; and (CHEM277 or CHEM272).
Restriction: Must be in the Chemistry or Biochemistry major.

BCHM485 Physical Biochemistry (3 Credits)
Physical Chemistry with applications to biological systems. Principal topics: quantum chemistry, spectroscopy, structural methods for biological macromolecules, statistical thermodynamics, transport processes in liquid phase, chemical and biochemical kinetics, modeling and simulation, polymer dynamics.
Prerequisite: Minimum grade of C- in CHEM481.
Restriction: Must be in Biochemistry program; or permission of instructor.
Credit Only Granted for: CHEM482 or BCHM485.

BIOE - Bioengineering

BIOE120 Biology for Engineers (3 Credits)
Introduction to the functions and interactions of biological systems from a quantitative perspective. Introduction to the modern experimental techniques and methods of data analysis. Roles for bioengineers in biology, and the role of biology in bioengineering will be elucidated.
Prerequisite: Must have completed or be concurrently enrolled in MATH140.
Restriction: Permission of ENGR-Fischell Department of Bioengineering department.

BIOE121 Biology for Engineers Laboratory (1 Credit)
Bioengineering encompasses numerous sub-disciplines that apply engineering principles to analyze biological systems and that utilize engineering design strategies to solve biological and biomedical problems. This course is aimed at providing students with the opportunity to learn how biology and engineering can synergistically contribute to our understanding of such problems, and to gain hands-on experience in basic techniques relevant to Bioengineering.
Prerequisite: Must have completed or be concurrently enrolled in BIOE120.
Restriction: Permission of ENGR-Fischell Department of Bioengineering department.

BIOE221 Academic and Career Planning (1 Credit)
Provides practical tools to help Bioengineering majors think critically about their goals and career paths. Guides Bioengineering students through accessing useful resources both on- and off-campus.
Prerequisite: Minimum grade of C- in BIOE120 and (BIOE121 or a minimum of 60 credits).
Restriction: Permission of ENGR-Fischell Department of Bioengineering and must be in Engineering: Bioengineering program.

BIOE232 Bioengineering Thermodynamics (3 Credits)
A quantitative introduction to thermodynamic analysis of bioengineering systems. Bioengineering encompasses a wide range of applications from nanoscale interactions (e.g. reactions between molecules), to cellular interactions (e.g. membrane electrical currents), to overall balances on organisms, all the way to large scale manufacturing. Each of these applications (and many others not mentioned) involve energy interactions which is the domain of thermodynamics. The basic laws of thermodynamics will be introduced and explained through a series of examples related to bioengineering systems.
Prerequisite: PHYS261 and PHYS260.
Restriction: Permission of ENGR-Fischell Department of Bioengineering department.
Credit Only Granted for: BIOE232, ENES232, ENME232, or ENME320.

BIOE241 Biocomputational Methods (3 Credits)
Introduction to programming and computational analysis in bioengineering using MATLAB. Emphasizes modeling of biological systems, biomedical data analysis, and engineering problem-solving. Includes an introduction to machine learning with applications such as biomedical signal classification and pattern recognition.
Restriction: Permission of ENGR-Fischell Department of Bioengineering and must be in Engineering: Bioengineering program.

BIOE246 Differential Equations for Bioengineering (3 Credits)
Students will learn to solve differential equations, including linear first order differential equations, higher order differential equations, and partial differential equations. In addition, students will learn to apply differential equations to concepts in bioengineering.
Prerequisite: Minimum grade of C- in MATH243 .
Restriction: Permission of the Fischell Department of Bioengineering.

BIOE331 Biofluids (3 Credits)
Principles and applications of fluid mechanics with a focus on bioengineering topics. Content includes conservation of mass, momentum, and energy, as well as the application of these fundamental relations to hydrostatics, control volume analysis, internal and external flow, and boundary layers. Mass transfer via diffusion and convection is also introduced. Applications to biological and bioengineering problems such as tissue engineering, bioprocessing, imaging, and drug delivery.
Prerequisite: Minimum grade of C- in ENES102, BIOE120, BIOE241, and BIOE246; and must have completed with a minimum grade of C- or be concurrently enrolled in BIOE232.
Restriction: Permission of ENGR-Fischell Department of Bioengineering and must be in Engineering: Bioengineering program.
Credit Only Granted for: BIOE331, ENCE305, ENFP300 or ENME331.

BIOE332 Transport Process Design (3 Credits)
Fluid flow, heat transfer, and mass transfer with applications in medicine, environment, biotechnology, food, agriculture, and other biosystems. Design of solutions to current problems in biological engineering is emphasized.
Prerequisite: BIOE331.
Restriction: Permission of ENGR-Fischell Department of Bioengineering department.

BIOE340 Quantitative Physiology (4 Credits)
Human physiology from a systems perspective is integrated with quantitative methods to inform modeling approaches and bioengineering designs. A laboratory component is included.
Prerequisite: Minimum grade of C- in BSCI330 and BIOE331.
Restriction: Permission of ENGR-Fischell Department of Bioengineering and must be in Engineering: Bioengineering program.
Credit Only Granted for: BIOE340, BSCI440, or BSCI450.

BIOE371 Linear Systems and Ordinary Differential Equations for Bioengineering Applications (3 Credits)
This class utilizes fundamentals in linear systems, including eigenvalues and eigenvectors, as well as linear differential equations, to study various problems in bioengineering and biological systems, with a particular emphasis on feedback, stability, controllability, and control design.
Prerequisite: BIOE241; and must have completed or be concurrently enrolled in MATH246.
Restriction: Permission on ENGR-Fischell Department of Bioengineering department.

BIOE372 Biostatistics for Experimental Design and Data Analysis (3 Credits)
This course will instruct students in the fundamentals of probability and statistics through examples in biological phenomenon, the design of bioengineering experiments, and clinical data analysis. Fundamentals covered in the course include probability distributions, hypothesis testing, power analysis, regression analysis, and correlation analysis.
Prerequisite: Minimum grade of C- in BIOE120 and BIOE241.
Recommended: MATH246.
Restriction: Permission of ENGR-Fischell Department of Bioengineering and must be in Engineering: Bioengineering program.
Credit Only Granted for: BIOE372 or STAT464.

BIOE386 Bioengineering Design and Teamwork (3 Credits)
Focuses on the engineering design process, including needs finding, problem definition, inclusive design, and prototyping. Students will join an existing senior capstone design team and contribute to the project. This elective is designed to be taken directly prior to BIOE485, and will collaborate with the students and projects in that course. Students who complete BIOE386 may have the option to continue their capstone project in BIOE485.
Prerequisite: Minimum grade of C- in BIOE120 and BIOE241; and must have earned a minimum of 60 credits.
Restriction: Permission of ENGR-Fischell Department of Bioengineering and must be in Engineering: Bioengineering program.

BIOE389 Special Projects in Bioengineering (1-3 Credits)
Exploring a variety of projects in Bioengineering.
Restriction: Permission of instructor; and permission of ENGR-Fischell Department of Bioengineering department.
Repeatable to: 6 credits.

BIOE399 Independent Study in Bioengineering (1-3 Credits)
Independent study.
Prerequisite: Permission of ENGR-Fischell Department of Bioengineering department.
Repeatable to: 12 credits if content differs.

BIOE404 Biomechanics (3 Credits)
Quantitative analysis of human movement using engineering mechanics and computational methods. Topics include kinematics, dynamics, inverse dynamics, joint biomechanics, anthropometry, and motion/force measurement, with hands-on labs and project-based learning focused on biomechanical modeling and analysis.
Prerequisite: Minimum grade of C- in ENES102, (MATH243 or MATH246), BIOE120, and BIOE241.
Restriction: Permission of ENGR-Fischell Department of Bioengineering and must be in Engineering: Bioengineering program.

BIOE411 Tissue Engineering (3 Credits)
A review of the fundamental principles involved in the design of engineered tissues and organs. Both biological and engineering fundamentals will be considered.
Prerequisite: Minimum grade of C- in BIOE120 and BSCI330; and must have earned a minimum of 60 credits.
Restriction: Permission of ENGR-Fischell Department of Bioengineering and must be in Engineering: Bioengineering program.

BIOE413 Stem Cell Engineering (3 Credits)
Provides an introduction to the role of stem cells in tissue growth and development, the engineering of stem cells and their environments for regenerative medicine applications, and disease modeling. Topics covered will include basic stem cell biology and mechanobiology; experimental methods for growing, differentiating, studying, and characterizing stem cells; stem cell integration into engineered microenvironments (e.g., tissue scaffolds and biomaterials, organ-on-chip devices, 3D-printed biomaterials); stem cell engineering in clinical applications and disease models; and ethical, commercialization, and regulatory issues in the field of stem cell engineering.
Prerequisite: Must have completed with a minimum grade of C- or be concurrently enrolled in BIOE340; and must have earned a minimum of 60 credits.
Jointly offered with: BIOE613.
Restriction: Permission of ENGR-Fischell Department of Bioengineering and must be in Engineering: Bioengineering program.
Credit Only Granted for: BIOE413 or BIOE613.

BIOE414 Macroscale Biomechanics (3 Credits)
An overview of current problems in movement biomechanics. After taking this course, students will be able to 1) Describe the engineering tools needed to study human movement 2) Recognize a variety of clinical research and practice, and 3) Use the framework provided by the course to pursue their own self-teaching and research on these topics. Topics covered include muscle mechanics, joint mechanics, EMG and EEG signal applications, ultrasonography and elastography, anthropometry, human movement 3-D kinematics, inverse dynamics, forward dynamics, work, power and energy. Biomechanics tools will be used to investigate clinical problems. Students will also do research projects on related topics.
Prerequisite: Minimum grade of C- in BIOE120, BIOE241, ENES102, and (MATH243 or MATH246).
Jointly offered with: BIOE614.
Restriction: Permission of ENGR-Fischell Department of Bioengineering department.
Credit Only Granted for: BIOE414 or BIOE614.

BIOE415 Engineering Design for Global Health (3 Credits)
Many medical technologies are not available in low and middle-income countries due to the cost, infrastructure, and medical expertise required to implement and sustain them. There is tremendous potential to increase access to health care through developing more affordable biomedical technologies, but effective design requires deep understanding of the problem. The goal of this course is to introduce the human-centered design framework and how it can be applied to design new biomedical technologies to solve challenges in global health.
Prerequisite: Minimum grade of C- in BIOE120; and must have earned a minimum of 60 credits.
Jointly offered with: BIOE615.
Restriction: Permission of ENGR-Fischell Department of Bioengineering and must be in Engineering: Bioengineering program.
Credit Only Granted for: BIOE415, BIOE615, BIOE489Y, or BIOE689I.
Formerly: BIOE489Y.

BIOE416 Cardiovascular Engineering (3 Credits)
An overview of engineering applications in the cardiovascular system. Covers cardiovascular anatomy, physiology and pathophysiology in the context of cell and tissue mechanics, fluid mechanics, thermodynamics, biotransport, neurovascular coupling, and imaging. Includes design of cardiovascular devices, sensors, biomaterials, and tissue engineered constructs.
Prerequisite: Minimum grade of C- in BIOE340.
Jointly offered with: BIOE616.
Restriction: Permission of ENGR-Fischell Department of Bioengineering and must be in Engineering: Bioengineering program.
Credit Only Granted for: BIOE416, BIOE616, BIOE489V, or BIOE689K.
Formerly: BIOE489V.

BIOE420 Bioimaging (3 Credits)
Covers the fundamental principles of major biomedical imaging techniques, including X-ray Imaging, Computer Tomography (CT), Magnetic Resonance Imaging (MRI), Ultrasound Imaging, Nuclear Medicine Imaging (SPECT/PET/CT), Optical Coherent Tomography (OCT), and Optical and Hyperspectral Imaging. The course will explore the underlying concepts of imaging system architectures, image reconstruction algorithms, and software implementation. Additionally, it will discuss the clinical interpretation of biomedical images and newer ways to use images for bio-related applications for diagnosis and analysis.
Prerequisite: Minimum grade of C- in BIOE120, BIOE241, and BIOE246.
Restriction: Permission of ENGR-Fischell Department of Bioengineering and must be in Engineering: Bioengineering program.

BIOE431 Fundamentals of Biosensor Techniques, Instrumentation, and Applications (3 Credits)
A thorough review of fundamental concepts of biosensing systems, principles of common detection methods, and modern applications of biosensors. Primarily literature driven. Students will obtain a detailed understanding of cutting-edge biosensing techniques, the instrumentation used, and the application space. Students also will develop skills in using current literature as a source of knowledge.
Prerequisite: Minimum grade of C- in BIOE120, CHEM135, and BSCI330.
Jointly offered with: BIOE631.
Restriction: Permission of ENGR-Fischell Department of Bioengineering and must be in Engineering: Bioengineering program.
Credit Only Granted for: BIOE431, BIOE631, or BIOE658W.

BIOE433 Optical Microscopy (3 Credits)
Includes a large variety of techniques central in many fields of biological and engineering research as well as clinical medicine. This course will provide a comprehensive overview of the fundamentals of optical microscopy. At a fundamental level, the course will cover the interaction of light with tissue, cells and biomaterials, and the mathematical foundations that describe optical systems.
Prerequisite: Minimum grade of C- in BIOE120 and (MATH243 or MATH246).
Restriction: Permission of ENGR-Fischell Department of Bioengineering and must be in Engineering: Bioengineering program.

BIOE437 Computer-Aided Design in Bioengineering (3 Credits)
Introduction to Computer-Aided Design (CAD). Lecture topics will summarize design methodology, review best-practices in hardware development, and discuss engineering applications. The course will culminate in a student-selected project leveraging CAD.
Prerequisite: Minimum grade of C- in BIOE120 or must be in Engineering: Bioengineering program.
Restriction: Permission of ENGR-Fischell Department of Bioengineering and must be in Engineering: Bioengineering program.
Credit Only Granted for: BIOE437, ENME414, or ENME272.

BIOE442 Python: Introduction to Programming and Data Analysis (3 Credits)
Provides an introduction to structured programming, computational methods, and data analysis techniques with the goal of building a foundation allowing students to confidently address problems in research and industry. Fundamentals of programming, algorithms, and simulation are covered from a general computer science perspective, while the applied data analysis and visualization portion makes use of the Python SciPy stack.
Prerequisite: Minimum grade of C- in BIOE120 and BIOE241.
Restriction: Permission of ENGR-Fischell Department of Bioengineering and must be in Engineering: Bioengineering program.

BIOE447 Clinical Experiences in Bioengineering (3 Credits)
An immersion experience in the clinical settings in which biomedical engineering strategies, technologies, and practices are applied. An emphasis will be placed on both clinical problems and engineering solutions.
Prerequisite: Minimum grade of C- in BIOE120 and must have earned a minimum of 60 credits.
Restriction: Permission of ENGR-Fischell Department of Bioengineering and must be in Engineering: Bioengineering program.

BIOE453 Biomaterials (3 Credits)
Examination of the structure and function of natural biomaterials, and cell-extracellular matrix interactions. Study physical properties of synthetic biomaterials for biomedical applications. Understanding molecular level interactions between biomolecules and biomaterials to design novel biomaterials with desirable characteristics. Application of biomaterials as implants, drug delivery systems, biosensors, engineered materials such as artificial skin and bone growth scaffolds will be covered.
Prerequisite: Minimum grade of C- in BIOE120 and CHEM231; must have earned a minimum of 60 credits.
Restriction: Permission of ENGR-Fischell Department of Bioengineering and must be in Engineering: Bioengineering program.
Credit Only Granted for: BIOE453, CHBE457, or ENMA425.

BIOE457 Biomedical Electronics & Instrumentation (4 Credits)
Students learn fundamental concepts of electronics, assembly of electronic components into functional circuits, and integration of functional electronic devices and circuits into a system. In the lab component, students will learn to assemble and evaluate circuits and systems.
Prerequisite: Minimum grade of C- in BIOE120, BIOE241, BIOE246, PHYS260, and PHYS261.
Restriction: Permission of ENGR-Fischell Department of Bioengineering department and must be in Engineering: Bioengineering program.

BIOE461 Synthetic Biology and Biological Engineering (3 Credits)
Students are introduce to the scientific foundation and concepts of synthetic biology and biological engineering. Current examples that apply synthetic biology to fundamental and practical challenges will be emphasized. The course will also address the societal issues of synthetic biology, and briefly examine interests to regulate research in this area.
Prerequisite: Minimum grade of C- in BIOE120, must have earned a minimum of 60 credits.
Restriction: Permission of ENGR-Fischell Department of Bioengineering and must be in Engineering: Bioengineering program.

BIOE462 Therapeutic Development and Delivery (3 Credits)
The ultimate purpose of the pharmaceutical and biotechnology industries is the development and delivery of therapeutics. This course covers fundamentals of engineering and the pharmaceutical sciences related to therapeutics, including basic pharmaceutics/drug delivery, pharmacokinetics, biomolecular kinetics, and regulatory issues. Specific focus is placed on biotherapeutics, including antibodies and protein engineering,RNA and DNA therapeutics (gene therapy and RNAi), extracellular vesicle biotechnology (exosomes), and cell-based therapies, including stem cells. The use of delivery technologies to enable therapeutics (e.g. nanomedicine) will also be discussed.
Prerequisite: Must have completed with a minimum grade of C- or be concurrently enrolled in BIOE340.
Restriction: Permission of ENGR-Fischell Department of Bioengineering and must be in Engineering: Bioengineering program.

BIOE464 Introduction to Computational Molecular Bioengineering (3 Credits)
Designed to introduce students to the principles, methods, and software used for simulation and modeling of macromolecules of biological interest such as proteins, lipids, and polysaccharides. Along with experiment and theory, computational modeling provides new tools for analysis, explanation and prediction. The course is also useful for students who plan to use experimental techniques as their primary approach, but who will employ computational modeling as a tool to obtain integrative understanding of complex systems. Finally, the course should be valuable as an introductory overview for students planning to conduct their thesis research in computational modeling of biological systems. Class topics: Basic statistical thermodynamics, Force fields, Molecular dynamics/ monte carlo methods, Conformational analysis, Fluctuations & transport properties, Free-energy calculations, Multiscale modeling.
Prerequisite: Minimum grade of C- in BIOE232, BIOE372, and BIOE442; and minimum grade of C- in BIOE371 or BIOE246; or permission of Fischell Department of Bioengineering.
Restriction: Permission of ENGR-Fischell Department of Bioengineering department.

BIOE468 Selected Topics in Bioengineering (3 Credits)
Selected topics in Bioengineering will be covered and taught by a variety of department faculty.
Prerequisite: BIOE120 and BIOE121.
Restriction: Permission of ENGR-Fischell Department of Bioengineering department.
Repeatable to: 9 credits if content differs.

BIOE474 Biopharmaceutical Process Development and Manufacturing (3 Credits)
Covers the fundamental steps involved in process development and manufacturing of biopharmaceuticals. An overview of different classes of biopharmaceuticals as well as manufacturing requirements for clinical development and regulatory approval will be provided. In depth coverage of manufacturing steps including cell culture, purification and formulation as well as drug product manufacturing, analysis and stability will be covered. Scientific literature will be used to highlight current challenges and novel solutions in each step of the manufacturing process. Scale up considerations, GMP requirements and process economics will also be introduced.
Prerequisite: Minimum grade of C- in BIOE120 and must have earned a minimum of 60 credits.
Jointly offered with: BIOE674.
Restriction: Permission of ENGR-Fischell Department of Bioengineering and must be in Engineering: Bioengineering program.
Credit Only Granted for: BIOE474, BIOE674, CHBE474, BIOE489T, or BIOE689E.
Formerly: BIOE489T.

BIOE485 Capstone Design I: Entrepreneurship, Regulatory Issues, and Ethics (3 Credits)
This is the first part of a two-semester senior capstone design course which covers principles involved in engineering design, design approaches, economics of design, ethics in engineering, and patent regulations. It also helps students learn team work and write design project proposals under the mentorship of a faculty advisor.
Prerequisite: 21 credits in BIOE courses; and must have completed or be concurrently enrolled in BIOE457.
Restriction: Permission of ENGR-Fischell Department of Bioengineering department; and senior standing; and must be in Engineering: Bioengineering program.

BIOE486 Capstone Design II (3 Credits)
This is the second part of the senior capstone design course. This part is independent instruction where faculty mentoring each project team works with students to order supplies, fabricate their proposed design under BIOE485, test the design, write the report and present it to their fellow seniors and board of faculty mentors. Students are taught to convert the blue print of a design to actual device and test it.
Prerequisite: Must have completed BIOE485 in the immediately preceding semester.
Restriction: Senior standing; and must be in Engineering: Bioengineering program; and permission of ENGR-Fischell Department of Bioengineering department.
Credit Only Granted for: BIOE486 or ENBE486.
Formerly: ENBE486.

BIOE488 Research Methods in Bioengineering (1-3 Credits)
Exploring a variety of research methods in the field of Bioengineering.
Restriction: Permission of ENGR-Fischell Department of Bioengineering department.
Repeatable to: 9 credits if content differs.

BIOE489 Special Topics in Bioengineering (1-3 Credits)
Exploring a variety of topics with Bioengineering.
Restriction: Permission of ENGR-Fischell Department of Bioengineering department.
Repeatable to: 6 credits.

BIOM - Biometrics

BIOM301 Introduction to Biometrics (3 Credits)
Descriptive statistics, introduction to probability, sampling, confidence interval estimation, hypothesis testing, simple regression and correlation. Emphasis on simple applications of statistical techniques and interpretation of statistical results.
Prerequisite: MATH113 or MATH115.

BIOM386 Experiential Learning (3-6 Credits)
Restriction: Junior standing or higher; and learning Proposal approved by the Office of Experiential Learning Programs, faculty sponsor, and student's internship sponsor.

BIOM405 Computer Applications in Biometrics (1 Credit)
An introduction to computer applications for data analysis. This is equivalent to the computer lab of 601 and is required for students that have taken BIOM301 and BIOM402 and wish to go directly into BIOM602.

BMGT - Business and Management

BMGT110 Introduction to the Business Value Chain (3 Credits)
Students are provided with an introduction to the business value chain with an emphasis on inter-organizational and intra-organizational coordination of core business processes. Emphasis is on cross-functional integration and the efficient and effective management of core processes with an emphasis on marketing, operations and supply chain management.

BMGT160 The Intentional Self (3 Credits)
As you navigate adulthood, you will constantly be making decisions that impact your personal and professional well being and success. Making these life choices with intention and a perspective of your whole self will increase your life satisfaction. In this course, you will examine who have been, who you are, and who you want to become. We will be exploring the six pillars of the whole self including purpose/character, relationships, wellness, community, prosperity, and nature and creating a vision for your future self.
Credit Only Granted for: BMGT160, BMGT198A, or BMGT198B.

BMGT161 Creative Problem Solving (3 Credits)
Examines the concept of creative problem solving as it applies in today's and tomorrow's complex business environment. Students will develop an understanding of the creative problem solving process with its distinctive cognitive steps of Divergent Thinking, Emergent Thinking and Convergent Thinking. Topics include creativity techniques for groups and individuals, creativity as a foundation to recognize business opportunities and develop innovative products and services, selecting ideas and making them stick, mental and organizational obstacles to creativity as well as an overview of electronic tools to increase creative capability.

BMGT162 The Future of You, Business and Society (3 Credits)
Designed to help you (students) explore the future of you, business, and society. Even as the nature of business (the how) evolves with technology, the purpose of business --to create individual and social prosperity (the why) --remains the same. This course will integrate the "why" and the "how" to prepare students for the future of work. Students will learn the foundational concepts of how to lead themselves with purpose and develop win-win relationships. Students will also learn how organizations solve unmet needs in society, and how they develop and leverage the power of technology and new business practices to create value in a sound and ethical way.

BMGT198 Special Topics in Business and Management (1-3 Credits)
Introductory special topics in business and management.
Repeatable to: 6 credits if content differs.

BMGT207 Ethics of Artificial Intelligence (3 Credits)
What ethical considerations should govern the creation, distribution, and use of artificial intelligence innovations in industry, polity, and society in the future? New and emerging innovations in artificial intelligence (AI) are disrupting sectors as diverse as healthcare, medicine, finance, operations, supply chain, manufacturing, media and journalism, and the creative industries. In the near future, the dependence of humans on AI for a myriad of social activities including companionship and care is also expected to accelerate. This course deals with the question of how we should ensure AI will create ethical economic and social systems that reflect the kind of world we want to live in 20 to 30 years from now. The values and ethics of society will influence and govern how AI can either contribute to humanity or lead to a dystrophic future.

BMGT210 Foundations of Accounting for Non Business Majors (3 Credits)
Provides an understanding of the common statements that report a company's profitability and financial health, and are useful to all economic agents who are engaged with the firm. Students will also recognize and understand managerial accounting as a system for accumulating and modeling information to support decision-making.
Restriction: Must not have completed BMGT221; and must not be in a major in the R.H. Smith School of Business.
Credit Only Granted for: (BMGT220 and BMGT221) or BMGT210.
Additional Information: Does not apply to a Smith School degree. Students pursuing a Smith School minor who have completed both BMGT220 and BMGT221 may substitute these courses for BMGT210. Credit will not be given for both BMGT210 and the combination of BMGT220 and BMGT221.

BMGT220 Principles of Accounting I (3 Credits)
Basic theory and techniques of contemporary financial accounting. Includes the accounting cycle and the preparation of financial statements for single owner and partnership forms of business organizations operating as service companies or merchandisers.

BMGT221 Principles of Accounting II (3 Credits)
Basic theory and techniques of accounting for managerial decision making. Involves the introduction of the corporation and manufacturing operations. Includes cost-volume-profit analysis and capital budgeting. Introduces the topics of income taxation and international accounting.
Prerequisite: BMGT220.

BMGT230 Business Statistics (3 Credits)
Introductory course in probabilistic and statistical concepts including descriptive statistics, set-theoretic development of probability, the properties of discrete and continuous random variables, sampling theory, estimation, hypothesis testing, regression and decision theory and the application of these concepts to problem solving in business and management.
Prerequisite: MATH113 or MATH115; or must have math eligibility of MATH120 or higher.
Restriction: Must not have completed ENCE302, ENME392, STAT400, BMGT231, or ENEE324.

BMGT251 The Societal Impact of Artificial Intelligence (3 Credits)
How will AI change society? AI is changing not only business, but the nature of society itself. This course investigates the nature of those changes and forecasts their future development. With a focus on the implications to business, including the nature of human jobs as AI does an increasing amount of work, students will debate the implications of AI through a variety of lenses. From definitions of consciousness and the potential for robots to claim rights to the gender implications of AI, we will explore its philosophical and political implications. As AI is also capital, we will interrogate what the advance of AI means to capitalists and for labor. Finally, we will enter the debate around whether AI will require more than machine learning to approximate general intelligence and whether it can truly be creative. Through the exploration of the unprecedented pitfalls and opportunities that AI represents, students will learn how best to cope with a world that is dependent on AI.
Credit Only Granted for: HNUH248C or BMGT251.
Formerly: HNUH248C.

BMGT262 The Enterprising Leader (3 Credits)
Designed to help students develop their leadership skills in order to identify their personal and professional purpose with an entrepreneurial mindset, and create strategies that will help them develop their abilities and achieve their aspirations by collaborating within teams and organizations. Students will apply insights from recent scholarship in entrepreneurship, leadership and strategic management to themselves in order to identify solutions to problems they find meaningful to solve in their own world. This self-discovery course will introduce students to the "CEO of ME, Inc." framework and tools such as the strategic initiatives matrix and business model canvas that they can use to help guide the choices that lie ahead, and develop collaborative, win-win relationships. In doing so, students will learn how to unlock the value of business in society and develop entrepreneurial and leadership skills that enable personal happiness and upward mobility.

BMGT263 Challenge your Thinking, Challenge the Conversation (3 Credits)
Provides conceptual frameworks and experiential opportunities that will enable students to engage in rational and respectful discourse. The course uses the latest pedagogical techniques and relevant literature to develop skills such as thinking like a scientist, negotiating conflict, and giving and receiving constructive feedback. Specific conversations will draw from current events and issues in business and in society.

BMGT264 SBLF Capstone Professional Practicum (3 Credits)
Provides students in the Smith Business Leadership Fellows Program (SBLF) with a capstone opportunity to learn in teams in a real-world setting. Companies engage teams of SBLF students with meaningful organizational challenges and dedicate resources to help students address these problems. Student teams enhance their skills in critical thinking, collaboration, negotiation, quality management and communication. These teams then apply these skills to offer value to a client. In the process, students will improve their teamwork skills.
Prerequisite: BMGT162, BMGT262 and BMGT263.

BMGT271 Globalization & Sustainability; How Does the Transformation of Global Value Chains Drive Equity and Sustainability? (3 Credits)
We live in an increasingly interconnected world. This course explores the fundamentals of international trade that form the basis for the complex modern network of global value chains and how these relationships can be adapted to address their vulnerability while also transformed to build a more equitable and sustainable future.
Cross-listed with: HNUH239I.
Credit Only Granted for: BMGT271 or HNUH239I.

BMGT289A Social Enterprise: Changing the World through Innovation and Transformative Action (3 Credits)
In this course, students will hear from real-life social entrepreneurs, explore current day social issues of sustainability, climate change, leadership, disruptive innovations, and create or blueprint business plans to generate positive social change. This class will focus on innovative thinking skills, personal narratives, and social interaction strategies and plans.

BMGT289B How Do Innovators Think? (3 Credits)
In this course, students will learn about: a) the innovation process and the role of the individual in generating innovations and b) the attributes, habits, and skills of individuals who have successfully started innovative new businesses or significantly added value to an existing company.

BMGT289D Frauds, Scams, and Thefts: What, How and Why? (3 Credits)
"Why" does fraud happen? "How" does society address fraud? And "What" can you do to avoid and prevent fraud in your personal and future career life? This course is designed to give future professionals and managers of all disciplines a general background of fraud. Topics include the psychology of fraud, the mechanics of fraud, the legal landscape, securities fraud, cybercrime, and what all of us should know to protect ourselves from becoming victims of fraud. Additionally, students experience 21st century lessons in fraud examination that have practical application to our daily lives: avoiding cognitive biases, interviewing techniques, basic business controls, and opening our minds to see what others might miss...the red flags of fraud.

BMGT289E Entrepreneurial Thinking for Non-Business Majors: How Not to Miss Great Opportunities Your Life Throws at You (3 Credits)
In this course, students learn how to analyze the world around them and then notice and define new trends, emerging problems, impending gaps, and how to turn these into exciting opportunities by providing creative solutions. Students will have a chance to not only sharpen their critical thinking skills, but also learn how to take initiative, develop a working solution, identify and resolve conflicts, and be confident and persistent, yet flexible enough to respond to changes. Student teams identify a compelling problem in present day life and then propose a creative solution taking into account possible difficulties in implementation. In addition, students will also be given problems on a much smaller scale and asked to create and present a workable solution. Students will be exposed to how a visionary's mind works and the creative solution process. In addition, students will also learn how entrepreneurial thinking can improve their day-to-day life.

BMGT289I Why Good Managers Make Bad Decisions (3 Credits)
This course provides an overview of the concepts, approaches, and vocabulary of evidence-based management (EBM) and provides an understanding of how experts in many disciplines can employ evidenced based decision making. EBM is an emerging movement in business to explicitly use the current best information in management decision making with special emphasis on relevant scientific findings and unbiased organizational facts. The course stresses how individuals practicing EBM learn how to rethink their approaches to data and knowledge in order to make more effective decisions.

BMGT289L The Proper Role of Government in a Free Enterprise System (3 Credits)
This course examines the proper role of the government in overseeing, promoting, or regulating various business activities in a free market system. Areas that warrant government involvement are identified and appropriate government responses are evaluated. The course identifies causes of market failure and discusses when, how and to what extent the government should act to remedy those failures. Finally, varieties of capitalism and the role of the government in other free enterprise counties are evaluated.

BMGT289M European Debt Crisis: More Integration or Withering of a Dream? (3 Credits)
This course explores the developments and events that led to the formation of the Economic and Monetary Union (EMU) and analyzes the causes for the eruption of the debt crisis. In addition, the course evaluates the policy steps taken to stabilize the crisis (monetary, banking, fiscal and institutional measures), and it discuss policy options to overcome in a lasting manner the design flaws and strengthen the governance of the EMU, so as to improve its overall economic growth performance.

BMGT298 Special Topics in Business and Management (1-3 Credits)
Introductory special topics in business and management.
Repeatable to: 6 credits if content differs.

BMGT299 Student Initiated Special Topics (1 Credit)
Student initiated special topics in business and management.
Repeatable to: 3 credits if content differs.

BMGT301 Information Systems, AI, and Digital Transformation (3 Credits)
Provides a comprehensive overview of information systems (IS) and their strategic and tactical roles in the digital transformation of businesses across public and private sectors. Students learn core concepts for analyzing and designing IS for business applications. Topics include data management, databases, data warehousing, data analysis, and data mining, along with the fundamentals and business impact of artificial intelligence (AI). The course also introduces modern IS infrastructure, including cloud computing, IS security, and practical use of application software, such as spreadsheets and data visualization software, for data analysis and visualization.
Additional Information: CMSC majors will not receive credit for this course towards their upper level concentration in their CMSC major. All BMGT majors, including students who are a double major in CMSC, must complete BMGT301 for their BMGT degree.

BMGT302 Essential Programming and AI Skills for Business Analytics (3 Credits)
This course introduces structured and object-oriented programming, focusing on their applications in business functions and analytics. Students will develop problem-solving skills and learn to design software solutions using programming logic and data structures. Emphasis is placed on hands-on learning through practical exercises using modern, high-level programming languages and industry-standard development tools. The course also introduces students to AI coding assistants, emphasizing fundamental prompt engineering techniques and AI augmented programming methods designed to enhance both productivity and code quality.
Prerequisite: BMGT301; or permission of BMGT-Robert H. Smith School of Business.
Restriction: Must not be in the Computer Science major .

BMGT310 Intermediate Accounting I (3 Credits)
Comprehensive analysis of financial accounting topics related to financial statement preparation and external reporting.
Prerequisite: BMGT221.

BMGT311 Intermediate Accounting II (3 Credits)
Continuation of BMGT310.
Prerequisite: BMGT310.

BMGT313 Financial Statement Analysis (3 Credits)
Provides students with the tools to conduct a financial statement analysis, which is part of an overall business analysis. Involves understanding and using the information that financial statements are communicating to users.
Prerequisite: BMGT221.

BMGT321 Managerial Accounting (3 Credits)
A study of the basic concepts of product costing and cost analysis for management planning and control. Emphasis is placed on the role of the accountant in organizational management, analysis of cost behavior, standard cost budgeting, responsibility accounting and relevant costs for decision-making.
Prerequisite: BMGT221.

BMGT323 Taxation of Individuals (3 Credits)
Federal taxation of individuals focusing on income, exclusions, deductions, depreciation, credits and capital transactions. Property coverage includes the tax consequences of sales and dispositions of investment and business assets. Both tax planning and compliance issues are covered.
Prerequisite: BMGT221.

BMGT326 Accounting Systems (3 Credits)
A study of accounting systems and computer and communications technology.
Prerequisite: BMGT221; and (BMGT201 or BMGT301).

BMGT332 Quantitative Models for Management Decisions (3 Credits)
The aim of this course is to introduce management science techniques for informed decision-making that can be applied in spreadsheet models to assist in the decision-analysis process. Models include Linear Programming, Transportation and Assignment problems, network flow models, Integer and non-linear programming, Simulation and Decision Trees.
Prerequisite: BMGT231 or BMGT230; or students who have taken courses with comparable content may contact the department.

BMGT340 Business Finance (3 Credits)
Students are introduced to the subject of finance with the focus on the financial management of a business. By the end of the course, students can do the following: apply time value of money and accounting principles to value investment securities (stocks and bonds), projects, and entire companies; describe and quantify the relationship between expected return and risk; and estimate a company's cost of capital. Students also will be able to apply these concepts to make better decisions about their personal finances.
Prerequisite: BMGT220 and BMGT230.

BMGT341 Financial Markets (3 Credits)
Shows the interconnectedness of the markets. The role of the Central bank and monetary policy is included in this context. Students develop an understanding of: (i) the determination of interest rates; (ii) financial instruments, markets and institutions; (iii) the impact of monetary policy on institutions; and (iv) how financial innovations create markets.
Prerequisite: Must have completed or be concurrently enrolled in BMGT340.

BMGT342 Wall Street Finance (3 Credits)
Using concepts and tools of finance, students will examine a wide range of business problems and explore possible solutions. The course is designed to improve a student's problem solving capabilities, business writing and communication skills, teamwork, and planning skills. Students will also gain experience in analyzing issues frequently faced by financial decision-makers.
Prerequisite: BMGT340.

BMGT343 Investments (3 Credits)
An introduction to financial investments and investment portfolio theory and practice. Topics include: Capital Markets; Investment Returns, Risks, and Constraints; Basic Securities Analysis; Factor Models; Modern Portfolio Theory; and Derivatives (Options & Futures). The course utilizes a combination of theory and empirical results to teach students about 1) Capital markets structure and understanding their role in corporate finance and investment banking; 2) Asset pricing theories used to analyze securities; 3) Theories and practices utilized in portfolio management; 4) Measuring systematic and diversifiable risk; and 5) Understanding the role of derivatives in the portfolio management process. The course will provide students with the information and skills needed to succeed in careers in asset management, securities research, corporate finance, risk management, trading, or sales.
Prerequisite: (MATH120 or MATH140) and BMGT340.
Credit Only Granted for: BMGT343 or ECON435.
Additional Information: This course cannot be used to fulfill any requirements for majors in Economics.

BMGT345 Foundations of Financial Management for Non Business Majors (3 Credits)
Provides students an overview of financial management. Students will understand how a business allocates financial resources in an uncertain environment to maximize shareholder value. In addition students will learn the following: how to apply accounting principles to corporate finance; how to value assets, projects, companies and investment securities; understand the relationship between risk and return and how it impacts investment and corporate decisions; how to calculate a company's cost of capital, and develop an intuitive comprehension of financial concepts and analysis.
Prerequisite: BMGT210 or BMGT220.
Restriction: Must not have completed BMGT340; and must not be a major in the R.H. Smith School of Business.
Credit Only Granted for: BMGT345 or BMGT340.
Additional Information: Course does not apply to a Smith School degree. BMGT340 may substitute for BMGT345.

BMGT347 Quantitative Financial Analysis (3 Credits)
Introduces students to data science for financial applications using an industry-standard programming language. Students will use tools ranging from regression models to machine learning to investigate questions across a variety of areas within finance including asset management, corporate finance and FinTech. The course will illustrate how big data and data analytics can improve financial decision-making by focusing on problems facing finance professionals.
Prerequisite: BMGT340; must have completed or be concurrently enrolled in BMGT343.
Credit Only Granted for: BMGT347 or BMGT448G.
Formerly: BMGT448G.

BMGT349 Private Equity and Venture Capital (3 Credits)
The New Markets Private Equity/Venture Capital Clinic allows students to gain professional experience commensurate with that of an Associate in a Venture Capital Firm. Students are trained to buy, own, actively manage and sell high growth technology companies in private transactions. The class format includes: lectures; presentations from guest speakers, including the regions leading CEOs, private equity and service providers; and a series of facilitated exercises that simulate buying, owning and selling businesses. The course exposes students to real life activities covering the entire deal process from market research, diligence, selection, negotiation valuing, and structuring an investment, as well as management, growth and exit of portfolio companies.
Prerequisite: Must have completed or be concurrently enrolled in BMGT313 and BMGT340.
Repeatable to: 6 credits.
Formerly: BMGT448B.

BMGT350 Marketing Principles and Organization (3 Credits)
An introduction to the concepts and principles of marketing including the marketing of service and nonprofit organizations. Provides an overview of all the concepts in marketing including relationship marketing, product development, pricing, promotion, marketing research, consumer behavior, international marketing, distribution and internal marketing to employees.
Recommended: ECON200.

BMGT351 Marketing Research Methods (3 Credits)
Focuses on aiding marketing decision-making through exploratory, descriptive and causal research. Develops student skills in designing market research studies, including selection of data collection method, development of data collection instrument, sample design, collection and statistical analysis of data and reporting the results, including data visualization.
Prerequisite: BMGT230; and must have completed or be concurrently enrolled in BMGT350.
Credit Only Granted for: BMGT351 or BMGT452.
Formerly: BMGT452.

BMGT354 Consumer Analysis (3 Credits)
Identifying buyer behavior concepts relevant to a specific marketing problem so that appropriate marketing decisions can be made. Conceptual frameworks are drawn from psychology, sociology, economics, and other social sciences to aid in understanding the behavior of ultimate and industrial buyers.
Prerequisite: BMGT350.
Credit Only Granted for: BMGT354 or BMGT451.
Formerly: BMGT451.

BMGT355 Foundations of Marketing for Non Business Majors (3 Credits)
Introduces the concepts and principles of marketing. Provides an overview of all the concepts in marketing including relationship marketing, product development, pricing, promotion, marketing research, consumer behavior, international marketing, distribution and internal marketing to employees.
Restriction: Must not have completed BMGT350; and must not be a major in the R.H. Smith School of Business.
Credit Only Granted for: BMGT355 or BMGT350.
Additional Information: Course does not apply to a Smith School degree. BMGT350 may substitute for BMGT355.

BMGT357 Marketing Internship (3-6 Credits)
Supervised work experience with a firm engaged in marketing goods or services. Students apply concepts learned in marketing classes and analyze the firm's organizational structure, environment and marketing strategy.
Prerequisite: BMGT350.
Restriction: Permission of BMGT-Robert H. Smith School of Business; and must be in a major in BMGT-Robert H. Smith School of Business.

BMGT360 Strategic Management of Human Capital (3 Credits)
Provides students with the basic knowledge needed to help organizations attract, select, develop, engage, evaluate, and retain talent. Topics covered may include strategic HRM, the role of globalization, legal issues in HRM, work analysis, HR planning, recruitment, personnel selection, performance management and appraisal, training and development, career development, compensation systems, motivating and rewarding performance, labor relations, and employee health and safety.

BMGT362 Negotiations (3 Credits)
By using a variety of assessment tools, feedback sources, skill-building exercises, and exercise debriefings, this experiential course is designed to enhance students' negotiating self-confidence and improve students' analytical skills, interpersonal skills, creativity and persuasive abilities.
Restriction: Must not have completed COMM425.
Credit Only Granted for: BMGT362 or COMM425.

BMGT363 Leadership and Teamwork in Organizations (3 Credits)
Provides a comprehensive understanding of fundamental leadership concepts, theories, and skills in organizations and applies to assessing and developing effective leadership practices in organizations.

BMGT364 Managing People and Organizations (3 Credits)
An introduction to selected aspects of human behavior in organizations generally known as organizational behavior (OB). This course is designed to help students develop systematic and fundamental understanding of people and their behaviors in organizations, as well as useful abilities and skills required to effectively and ethically manage various individual, interpersonal, group, and organization-level processes.

BMGT365 Entrepreneurial Finance and Private Equity (3 Credits)
Studies venture capital and private equity using a combination of cases, lectures and guest speakers. Addresses how venture capitalists provide capital to start-up firms in growing industries and how private equity markets provide capital to help established medium-sized firms (often family businesses) grow and restructure. Focuses on how financial, legal, and economic issues are dealt with in the financial contracts between venture capitalists and their limited partners and between capitalists (or other private equity investors) and the firms in which they invest.
Prerequisite: BMGT461 or BMGT361.
Restriction: Junior standing or higher.
Credit Only Granted for: BMGT365, ENES466, SMLP471 or HLMN471.

BMGT366 Growth Strategies for Emerging Companies (3 Credits)
Offers practical management tools that are needed to build a new venture into a significant enterprise. The competencies, strategies and structures of successful high performance businesses are studied through cases, videos and guest lecturers. Topics include leadership, internal growth strategies, merger, acquisition and franchising.
Prerequisite: BMGT461 or BMGT361.
Restriction: Junior standing or higher.

BMGT367 Career Search Strategies in Business (1 Credit)
An overview and opportunity to practice job search skills critical to obtaining internships and full-time positions. Course will cover strategies for exploring career options, preparing job search materials, development of job search skills such as interviewing and networking. Students are encouraged to take this course in the sophomore or junior year.
Restriction: Must be in a major in BMGT-Robert H. Smith School of Business.

BMGT369 Experiential Learning in Business Innovation and Entrepreneurship (1-3 Credits)
Selected experiential learning opportunities in business innovation and entrepreneurship
Repeatable to: 15 credits if content differs.
Additional Information: Priority will be given to students enrolled in the Management Major, Innovation and Entrepreneurship Minor, and the General Business Minor.

BMGT370 Introduction to Transportation (3 Credits)
An overview of the transportation field with an emphasis on freight movements from the perspective of both providers of capacity and users of freight services. Examines the characteristics of the freight modes and the role of each mode as a major component of logistics and supply chain management. Explores the economics, energy use, and finances of each mode as well as the impact of government policies on each mode's future. Discussion of infrastructure and capacity needs of the transportation system and its ability to support the economy.

BMGT372 Introduction to Logistics and Supply Chain Management (3 Credits)
Supply chain management involves the coordination of suppliers, manufacturers, distributors, and retailers to ensure that products and services are available to the final consumer in a timely and cost-effective fashion. Logistics management is the subset of supply chain management dealing with the physical flows of product and includes such activities as transportation management, warehousing, materials handling, inventory management, and order fulfillment. Attention is paid to the logistics cost trade-offs within the firm and between members of the supply chain.
Credit Only Granted for: BMGT375 or BMGT372.

BMGT373 Supply Chain Management Internship (3-6 Credits)
Involves supervised work experience in supply chain management, logistics and/or transportation. Students will be expected to relate course material to work experience in an analysis of a firm's operations.
Prerequisite: BMGT370 or BMGT372.
Restriction: Permission of BMGT-Robert H. Smith School of Business.

BMGT374 Supply Chain Risk Management (3 Credits)
Since supply chain risk is increasingly more recognized as an organizational threat, and therefore a critical part of corporate strategy; this course examines a wide range of supply chain risk and develops a process to identify, assess, and prioritize this risk. Through a series of readings and case studies, the course focuses on factors that contribute to supply chain risk within the firm as well as the supply chain. Strategies to mitigate risk are explored.
Credit Only Granted for: BMGT478C or BMGT374.
Formerly: BMGT478C.

BMGT375 Supply Chain Management for Non Business Majors (3 Credits)
Examines management decision-making in the design, implementation and coordination of a firm's supply chain activities. Topics include transportation management, warehousing, materials handling, inventory management, and order fulfillment.
Restriction: Must not have completed BMGT372; and must not be a major in the Robert H. Smith School of Business.
Credit Only Granted for: BMGT375 or BMGT372.
Additional Information: Course does not apply to a Smith School degree. Course may be substituted by BMGT372 for General Business minor students only.

BMGT380 Business Law I (3 Credits)
Legal aspects of business relationships. Examination of torts and business crimes, contracts and agency. The law of personal property and bailment relationships. Survey of public policy issues.

BMGT382 Marketing and Innovation for Entrepreneurs (3 Credits)
Marketing and Innovation are two critically important activities that determine success in any business venture. This course will focus on understanding the fundamentals of marketing and innovation from the perspective of an entrepreneur. At a broad level, we will apply proven marketing frameworks (STP and 4Ps) to effectively deliver innovation in an entrepreneurial context.
Restriction: Must not have completed BMGT352.
Credit Only Granted for: BMGT352, BMGT382 or BMGT456.
Additional Information: Course will not satisfy a Marketing major requirement.

BMGT383 The Business of Sports (3 Credits)
An overview of the history of sports management as a profession, while examining the many essential business principles necessary for effective leadership in the industry.

BMGT384 Innovation & Analytics in Sports (3 Credits)
Explores the intersection of innovation, quality management, design thinking and analytics in the sports industry. Students will learn to apply design thinking methodologies, quality tools, and consulting techniques to evaluate current trends and emerging opportunities. Through research and data analysis, students will develop strategic solutions to real-world challenges, enhancing their ability to drive innovation and improve decision-making in the evolving sports landscape.
Prerequisite: BMGT383.

BMGT385 Operations Analytics (3 Credits)
Designed to equip the student with analytical tools to make capacity, inventory, quality, and other operational decisions in both manufacturing and service business enterprises. Examines the strategic role the operations function can play and offers techniques that the firm can use for execution using a systems approach. Analyze operational systems to align supply with demand to maximize value for the organization. Covers critical operations analytics concepts and models, including process flowcharting, capacity and bottleneck analysis, waiting line management, inventory management, Six Sigma, and Lean.
Credit Only Granted for: BMGT385 or ENME426.

BMGT386 General Business Internship (3-6 Credits)
Supervised work experience in business. Students will be expected to relate course material to work experience in an analysis of a firm's operations.
Restriction: Permission of BMGT-Robert H. Smith School of Business; and must be in a major in BMGT-Robert H. Smith School of Business.

BMGT390 Designing Innovative Systems (3 Credits)
The QUEST systems thinking course challenges students to analyze how processes interact in larger systems. Students will learn how to use process improvement tools and a systems thinking approach to solve problems and design innovative solutions. By drawing upon their multidisciplinary backgrounds, students will be able to understand and reframe problems from multiple perspectives to uncover new solutions.
Prerequisite: ENES190, BMGT190, ENED290 or BMGT290.
Cross-listed with: ENED390.
Restriction: Must be in the QUEST program.
Credit Only Granted for: BMGT390, ENES390 or ENED390.
Formerly: ENES390.

BMGT392 Introduction to International Business Management (3 Credits)
A study of the domestic and foreign environmental factors affecting the international operations of U.S. business firms. The course also covers the administrative aspects of international marketing, finance and management.
Prerequisite: ECON200.

BMGT394 Applied Quantitative Analysis (3 Credits)
The QUEST data analysis course takes a human-centered approach to data analysis and focuses on teaching students how to frame the core problem, choose the right data, and uncover deep insights from data to build an understanding of people and expose opportunities for innovation. Students will use visualization and statistical techniques to explore data, generate insights, and share the human stories behind the data to move people to action.
Cross-listed with: ENED394.
Restriction: Must be in the QUEST Program.
Credit Only Granted for: BMGT394, ENED394, ENES489A or BMGT438A.
Formerly: BMGT438A and ENES489A.

BMGT395 Principles of Management for Non Business Majors (3 Credits)
Introduces concepts related to organization behavior. Topics include leadership, team decision making and management, conflict resolution and negotiations, organizational culture, and organization change. Students will learn how to apply those concepts and theories to understanding and critically analyzing various individual, interpersonal, group, and organizational management processes.
Restriction: Must not have completed BMGT364; and must not be a major in the Robert H. Smith School of Business.
Credit Only Granted for: BMGT395 or BMGT364.
Additional Information: Course does not apply to a Smith School degree. Course may be substituted by BMGT364 for General Business minor students only.

BMGT396 Design and Innovation in Silicon Valley (3 Credits)
QUEST students will learn about design, innovation, and quality by studying the operations of Silicon Valley companies. This course will provide students with the opportunity to learn first-hand from a number of these organizations during visits over spring break.
Cross-listed with: ENED396.
Restriction: Must be in the QUEST program.
Credit Only Granted for: BMGT396, ENED396, BMGT438G, or ENES489Q.
Formerly: BMGT438G or ENES489Q.

BMGT397 Mentoring Multidisciplinary Teams (3 Credits)
QUEST mentors serve a valuable purpose in the program as they coach new cohorts of students progressing through BMGT/ENED290H. Mentors will learn and practice essential team-building and facilitation skills, including effective communication, conflict management, strengths-based leadership, and lesson planning. They will use these leadership skills to inspire their 290H teams and improve team performance.
Prerequisite: BMGT290 or ENED290.
Cross-listed with: ENED397.
Restriction: Must be in the QUEST Program (TQMP).
Credit Only Granted for: BMGT397, ENES397 or ENED397.

BMGT398 Individual Study in Business and Management (1-3 Credits)
Restriction: Permission of BMGT-Robert H. Smith School of Business.
Repeatable to: 6 credits.

BMGT399 Special Topics in Business and Management (1-3 Credits)
Special topics in business and management.
Repeatable to: 9 credits if content differs.

BMGT400 Storytelling with AI and Data Visualization (3 Credits)
This course introduces finding and communicating business stories using artificial intelligence and data visualization techniques. As data-driven decision-making becomes increasingly central to modern organizations, professionals must be able to explore complex datasets and translate findings into clear, powerful visual narratives that support strategic insights. Students will examine principles of effective visual communication and cognitive design, consider misinformation in storytelling, and practice tailoring narratives to diverse audiences. They will gain experience developing interactive dashboards and integrating quantitative and qualitative insights into cohesive narratives, enabling them to translate complex data into insights that drive strategic business decisions in an AI-augmented professional environment.
Prerequisite: BMGT302.
Credit Only Granted for: BMGT400 or BMGT408V.
Formerly: BMGT408V.

BMGT401 Big Data and AI Infrastructure (3 Credits)
Big data offers organizations unprecedented opportunities to uncover insights and create value. Artificial intelligence (AI) now permeates daily life and drives innovation across industries such as finance, transportation, and healthcare. Advances in network infrastructure have made big data and AI tools more accessible and affordable for businesses of all sizes. Many organizations still face significant challenges in launching, managing, and scaling AI initiatives that rely on large, unstructured datasets. This course equips students with a solid foundation in key big data and AI technologies through hands-on, experiential learning. By the end of the course, students will be prepared to contribute to the successful design, implementation, and governance of complex data-driven strategies.
Prerequisite: BMGT302.
Credit Only Granted for: BMGT401 or BMGT408E.
Formerly: BMGT408E.

BMGT402 AI Augmented Database Systems (3 Credits)
Examines the fundamentals of database management systems (DBMS), emphasizing data models, query processing, data warehouses, and their role in developing business information systems. Students will master key concepts and gain hands-on experience using industry-standard platforms. They will leverage artificial intelligence (AI) assistants and apply prompt engineering techniques to enhance productivity. The course also explores the value of information resources and common information management challenges within organizations.
Recommended: BMGT302.
Credit Only Granted for: INST327 or BMGT402.

BMGT403 Systems Analysis and Design (3 Credits)
Techniques and tools applicable to the analysis and design of computer-based information systems. System life cycle, requirements analysis, logical design of databases and performance evaluation. Emphasis on case studies. Project required that involves the design, analysis and implementation of an information system.
Prerequisite: BMGT301; or students who have taken courses with comparable content may contact the department.
Recommended: BMGT302.

BMGT404 Essential Data and AI Skills for Business Analytics (3 Credits)
Building on prior programming knowledge, this course introduces principles of data science and AI for business analytics. Students will learn to collect, organize, analyze, and visualize data to support decision-making in areas such as finance, accounting, marketing, and operations. The course emphasizes practical, hands-on exercises using modern, high-level programming languages and industry-standard software. Students will also explore AI tools for analytics, learning their capabilities, limitations, and how they can augment data-driven insights.
Prerequisite: BMGT302.
Credit Only Granted for: BMGT404 or CMSC320.
Additional Information: CMSC majors will not receive credit for this course towards their upper level concentration in their CMSC major.

BMGT406 AI Augmented App Development (3 Credits)
Explores the design and development of modern web applications, emphasizing the platforms, standards, and technologies that power the web. Students will gain hands-on experience building dynamic, data-driven applications while learning to leverage AI assistants and prompt engineering techniques to improve productivity and enhance application functionality. The course also examines social media, social networking, and crowdsourcing, focusing on their roles and applications within organizations.
Prerequisite: BMGT302.
Credit Only Granted for: INST377 or BMGT406.

BMGT407 Information Systems Projects (3 Credits)
Senior capstone course for the information systems major. Collected knowledge from the IS courses and application to significant problems of size and complexity. State-of-the-art research ideas and current business and industrial practices in information systems.
Prerequisite: BMGT302, BMGT402 and BMGT403.
Restriction: Senior standing.

BMGT408 Emerging Topics in Information Systems (3 Credits)
Selected advanced topics covering emerging developments in the field of decision and information technologies.
Restriction: Permission of BMGT-Robert H. Smith School of Business.
Repeatable to: 9 credits if content differs.

BMGT410 Government Accounting (3 Credits)
An introduction to the theory and practice of accounting and financial reporting as applied in both federal and state/local governments, with a focus on generally accepted accounting principles applicable in each. Topics include analyzing transactions; recognizing transactions in the accounting cycles; and preparing and analyzing financial statements and the overall financial reports at both the federal and state/local government levels.
Prerequisite: BMGT221.

BMGT411 Ethics and Professionalism in Accounting (3 Credits)
Analysis and discussion of issues relating to ethics and professionalism in accounting.
Prerequisite: BMGT311.
Restriction: Must be in Accounting program.

BMGT417 Taxation of Corporations, Partnerships and Estates (3 Credits)
Federal taxation of corporations using the life-cycle approach-formation, operation, assessment, merger, reorganization and liquidation. Overviews of pass-through entities - partnerships and s-corporations -using the life-cycle approach, and the tax consequences of wealth transfers by individuals - gift and estate taxation. Both tax planning and compliance issues are addressed.
Prerequisite: BMGT221.

BMGT422 Auditing Theory and Practice (3 Credits)
A study of the independent accountant's attest function, generally accepted auditing standards, compliance and substantive tests and report forms and opinions.
Prerequisite: BMGT310; and must have completed or be concurrently enrolled in BMGT311.

BMGT423 Fraud Examination (3 Credits)
The focus of this course in fraud accounting is on fraud prevention, detection, and investigation as relevant to accountants and fraud examiners. Most organizations are affected to some degree by the occurrence of fraud, whether or not reported. It is estimated that organizations, WORLDWIDE, lost roughly 5% of their annual revenues to fraud. Despite advances in technology, the problem of fraud continues to escalate; and in particular, cybercrime is growing at an alarming rate. The course will serve as an introduction to all of the topics covered in the Certified Fraud Examiner (CFE) examination. While not purporting to be an exam preparation course, the diligent student could be CFE exam ready soon after taking this course. This course provides an introduction to the profession of fraud examination for accounting majors or for individuals seeking to satisfy the educational requirements for the CPA examination.
Prerequisite: BMGT220 or BMGT210.

BMGT424 Advanced Accounting (3 Credits)
Advanced accounting theory applied to specialized topics and current problems. Emphasis on consolidated statements and partnership accounting.
Prerequisite: BMGT311.

BMGT428 Special Topics in Accounting (3 Credits)
Selected advanced topics in Accounting.
Repeatable to: 9 credits if content differs.

BMGT430 Data Modeling in Business (3 Credits)
Explores the role of statistical models in business analytics to drive managerial decision-making and improve performance through the use of relevant data-motivated examples. Topics include regression models (both simple and multiple regression, as well as logistic regression for binary data), model validation, variable transformation, variable selection, discriminant analysis, and forecasting. These topics are modeled using state-of-the-art data analytics software.
Prerequisite: BMGT231 or BMGT230; or permission of BMGT-Robert H. Smith School of Business.

BMGT431 Data Analytics and AI for Business (3 Credits)
An introduction to the tools and machine learning techniques that are central to the analysis of data in order to discover patterns and relationships that are helpful for better business decisions.
Prerequisite: BMGT430.

BMGT434 Analytics Consulting: Cases and Projects (3 Credits)
This course assumes that students have already been introduced to the concepts and techniques of operations research/business analytics (OR/BA). Published papers, short cases, and projects in OR/BA will be analyzed and discussed in a thoughtful way, taking into account the soft (people-related) issues and the hard (mathematical/optimization) issues.
Prerequisite: BMGT332.

BMGT435 Business Process Simulation (3 Credits)
Covers the methods for computer simulation modeling and analysis of complex systems. Students are assumed to have been introduced to the basic techniques and applications in the field of operations management and business analytics. Course emphasis is on modeling of real-world systems (for example, inventory or queueing systems), implementing simulations in special purpose software, and analyzing simulation results.
Prerequisite: BMGT332.

BMGT438 Special Topics in Operations Management (1-3 Credits)
Selected advanced topics in operations management.
Repeatable to: 6 credits if content differs.

BMGT440 Advanced Financial Management (3 Credits)
Lectures and analysis of problems and cases relating to financial decisions of the firm including capital budgeting, capital structure and cost of capital, valuation (discounted cash flow, comparable multiples, comparable transactions), mergers and acquisitions, options, dividend policy, and initial public offerings.
Prerequisite: BMGT340.

BMGT441 Fixed Income (3 Credits)
The course provides an understanding of fixed income securities and methods used to value, analyze, and hedge their risk by participants in the financial services industry (e.g. commercial and investment banks, insurance companies, pension funds, investment companies, hedge funds). Topics covered include zero coupon bonds, coupon bonds, spot and forward rates, bond price sensitivity to interest rate changes (duration and convexity), interest rate derivatives such as forwards, swaps, futures and options, term structure of interest rates, credit risk, and credit derivatives. A thorough review of basic time value of money, continuous time value of money, and derivative securities formulas will be necessary and included while covering the related fixed income instruments.
Prerequisite: BMGT340.

BMGT442 Advanced Portfolio Management (3 Credits)
An in-depth coverage of statistical methods for choosing stocks is provided. Financial markets data is used in the class. Students are also expected to learn and use an industry-standard programming language during the class to implement the concepts of the class.
Prerequisite: BMGT343 and BMGT347.

BMGT443 Applied Equity Analysis and Portfolio Management (3 Credits)
Study and application of the concepts, methods, models, and empirical findings to the analysis, valuation and selection of securities, especially common stock.
Prerequisite: BMGT343.

BMGT444 Futures and Options Contracts (3 Credits)
The institutional features and economic rationale underlying markets in futures and options. Hedging, speculation, structure of futures prices, interest rate futures, efficiency in futures markets and stock and commodity options.
Prerequisite: BMGT343.
Credit Only Granted for: BMGT444 or MATH424.

BMGT445 Banking and Financial Institutions (3 Credits)
Analysis and discussion of cases and readings in commercial bank management. The loan function is emphasized; also the management of liquidity reserves, investments for income and source of funds. Bank objectives, functions, policies, organization, structure, services and regulation are considered.
Prerequisite: BMGT340.
Recommended: ECON330 or BMGT341.

BMGT446 International Finance (3 Credits)
Financial management from the perspective of the multinational corporation. Topics covered include the organization and functions of foreign exchange and international capital markets, international capital budgeting, financing foreign trade and designing a global financing strategy. Emphasis of the course is on how to manage exchange and political risks while maximizing benefits from global opportunity sets faced by the firm.
Prerequisite: BMGT340.

BMGT448 Special Topics in Finance (1-3 Credits)
Selected advanced topics in finance.
Repeatable to: 9 credits if content differs.

BMGT449 Investment Fund Management: Lemma Senbet Fund (3 Credits)
The Lemma Senbet Fund is a year-long, advanced finance course available to undergraduate finance majors in their senior year. Ten to twelve students will be selected in the spring of their junior year to participate on the fund, two as portfolio managers and eight to ten as equity analysts. The course provides students with the opportunity to apply what they have learned in finance classes to actual investment decisions, through researching real companies and managing a portfolio of real money.
Prerequisite: BMGT343.
Corequisite: BMGT443.
Restriction: Permission of BMGT-Robert H. Smith School of Business.
Repeatable to: 6 credits if content differs.

BMGT450 Integrated Marketing Communications (3 Credits)
In-depth study of coordinated marketing activities including advertising, sales promotion, Internet marketing, direct marketing and personal selling. Emphasizes strategic planning to effectively use these promotional tools to communicate with customers and meet marketing goals. Blends theory and current practice to provide managerial orientation.
Prerequisite: BMGT350.
Restriction: Must be in a major in BMGT-Robert H. Smith School of Business.

BMGT453 Retail Management (3 Credits)
Planning and implementing retail marketing strategy. Application to store and non-store (catalog, internet) retailing. Evaluation of how environmental trends in the consumer market, competition, the economy and technology affect retail strategy in the U.S. and global market.
Prerequisite: BMGT220 and BMGT350.
Credit Only Granted for: BMGT353 or BMGT453.
Formerly: BMGT353.

BMGT454 Global Marketing (3 Credits)
Marketing functions from the global executive's viewpoint, including coverage of global marketing policies relating to product adaptation, data collection and analysis, channels of distribution, pricing, communications and cost analysis. Consideration is given to the cultural, legal, financial and organizational aspects of global marketing.
Prerequisite: BMGT350.

BMGT455 Sales Management (3 Credits)
The roles of the sales executive as a planner, manager of resources and marketing functions and recruiter, trainer, motivator and leader of field sales personnel. Techniques and sequence of problem analysis for selling and sales management decisions and to the practical framework in which these decisions take place. Teaching vehicles feature strong classroom interactions, cases, journal articles, research findings, guest sales managers, debates, and modern company practices.
Prerequisite: BMGT350.

BMGT456 Customer-Centric Innovation (3 Credits)
Addresses the management of new products and services with a focus on the innovation process, specifically the development and launching of new products or services: Opportunity Identification, Concept Generation, Design, Testing and Launch.
Prerequisite: BMGT350.
Credit Only Granted for: BMGT352, BMGT382 or BMGT456.
Formerly: BMGT352.

BMGT457 Marketing Policies and Strategies (3 Credits)
This capstone course ties together various marketing concepts using the fundamentals of strategic market planning as the framework. Application of these principles is accomplished by analyzing and discussing cases and by playing a marketing strategy computer simulation game. Analysis of current business articles to understand the link between theory and real-world problem solving.
Prerequisite: BMGT350.

BMGT458 Special Topics in Marketing (1-3 Credits)
Selected advanced topics in marketing.
Repeatable to: 6 credits if content differs.

BMGT461 Entrepreneurship (3 Credits)
Process of creating new ventures, including evaluating the entrepreneurial team, the opportunity and the financing requirements. Skills, concepts, mental attitudes and knowledge relevant for starting a new business.
Restriction: Must not have completed BMGT361.
Credit Only Granted for: BMGT261, BMGT361, BMGT461, ENES460, SMLP470 or HLMN470.

BMGT463 Cross-cultural Challenges in Business (3 Credits)
Examines in depth the nature of international cultural value-differences and their behavioral-related effects in the workplace. Topics include decision-making and leadership styles and reactions to various work assignments and reward structures.
Restriction: Must be in a major in BMGT-Robert H. Smith School of Business.

BMGT465 Business Plan For The New Venture (3 Credits)
Each student focuses on the production of a business plan that will be accepted for an annual business plan competition. Business plans of sufficient quality may be submitted to attract financing. Topics include a deep review of business construction and its derivative short forms.
Prerequisite: BMGT461 or BMGT361.

BMGT466 Global Business Strategy (3 Credits)
Focuses on the strategic challenges that directly result from and are associated with the globalization of industries and companies. Topics include drivers of industry globalization, difference between global and multi-domestic industry, global expansion strategies, sources of competitive advantage in a global context, and coordination of a company across a global network.
Restriction: Must be in a major in BMGT-Robert H. Smith School of Business.

BMGT467 Strategic Innovation and Entrepreneurship (3 Credits)
Provides an understanding of how innovation affects the competitive dynamics of markets, how firms can strategically manage innovation, and how firms can create and implement strategies to maximize their likelihood of success.
Credit Only Granted for: BMGT467, ENES463 or HLMN472.

BMGT468 Special Topics in Management and Organization (1-3 Credits)
Selected advanced topics in management and organization.
Repeatable to: 6 credits if content differs.

BMGT469 Management and Organization Short-term Study Abroad (3 Credits)
Selected short-term study abroad topics in management and organization.
Repeatable to: 9 credits if content differs.

BMGT472 Purchasing and Inbound Logistics (3 Credits)
Analysis of the resupply activities of logistics management, including purchasing policies, transportation planning, and inventory control. Attention is directed toward total cost minimization and the establishment of a sustainable competitive advantage based on procurement.
Prerequisite: BMGT372.

BMGT475 Supply Chain Strategy and Network Design (3 Credits)
Analysis of the strategic aspects of supply chain management. Emphasis on the creation of end-user value through supply chain cost reductions, service improvements or both. Attention is directed toward the enabling role of technology in support of strategy evaluation and implementation.
Prerequisite: BMGT372.

BMGT476 Technology Applications in Supply Chain Management (3 Credits)
An understanding of the role of technology in managing the supply chain. Provides students with hands-on experience in advanced software systems that build on top of enterprise resource planning systems. Major emphasis is placed on demonstrating that these systems result in supply chain cost reductions and service improvements.
Prerequisite: BMGT372.

BMGT477 International Supply Chain Management (3 Credits)
The study of the importance of the supply chain management within a global context. Topics covered include: the structure, service, pricing and competitive relationships among international carriers and transport intermediaries as well as documentation, location decisions, international sourcing/distribution and management of inventory throughout the international supply chain.

BMGT478 Special Topics in Supply Chain Management (3 Credits)
Selected advanced topics in supply chain management.
Repeatable to: 9 credits if content differs.
Additional Information: Course prerequisites will vary depending on the topic. A maximum of 3 credits of BMGT478 course work can fulfill Supply Chain Management major requirements.

BMGT483 Sports Management Program Capstone (3 Credits)
Through interdisciplinary collaboration, students will work in teams to apply their knowledge and skills in sports management to a real-world case. Student teams will be charged to develop innovative and creative solutions to sports management challenges while considering the ethical implications of their proposals.
Prerequisite: BMGT383.

BMGT484 Digital Marketing (3 Credits)
Examines the process of developing, implementing, and analyzing strategies for successfully marketing a variety of existing and potential products and services through digital means, including the web, social media, and mobile apps. Both the development and analysis of digital media for marketing will be discussed.
Prerequisite: BMGT350.
Restriction: Must be in a major in BMGT-Robert H. Smith School of Business.

BMGT485 Project Management (3 Credits)
Modern project management techniques that are used by modern practicing professionals will be covered. Particular attention is given to the management of technology based systems and projects in a business enterprise. The topics covered include: defining project scope, alignment of projects with enterprise strategy, managing project cost, time and risks using tools such as CPM/PERT, and measuring project performance.
Prerequisite: BMGT231 or BMGT230; or students who have taken courses with comparable content may contact the department.
Restriction: Must be in a major in BMGT-Robert H. Smith School of Business.
Credit Only Granted for: BMGT485, ENCE320, ENCE325, INST408O or INST453.

BMGT487 Six Sigma Innovation (3 Credits)
Enhances the overall understanding of Six Sigma Strategy, Tools and Methods to positively influence the performance of a business process, a product or service. Highlights the application of Define-Measure-Analyze-Improve-Control (DMAIC),Design For Six Sigma (DFSS), and the pursuit of Critical to Quality criteria (CTQ's) in a collaborative perspective, one that recognizes a balance between efficiency, and effectiveness and between statistical analysis and statistical thinking.
Prerequisite: STAT400, BMGT231, BMGT230, or ENME392.

BMGT488 Special Topics in Logistics, Business, and Public Policy (1-3 Credits)
Selected advanced topics in logistics, business and public policy.
Repeatable to: 6 credits if content differs.

BMGT490 QUEST Capstone Professional Practicum (4 Credits)
The capstone course for the QUEST Honors Program provides students with an opportunity to learn in multidisciplinary teams of business, engineering, and science students in a real-world setting. Companies engage teams of QUEST students with real organizational challenges and dedicate resources to help students address these problems. Student teams must enhance their skills in quality management, process improvement, and systems design and will apply these to add value to a client. In the process, students will improve their teamwork skills.
Prerequisite: BMGT390, ENES390 or ENED390.
Cross-listed with: ENED490.
Credit Only Granted for: BMGT490, ENES490 or ENED490.
Formerly: ENES490.

BMGT491 Scoping Projects for Business Impact (3 Credits)
Students cultivate relationships with new and current corporate partners and prepare project scopes for QUEST courses. As part of the scoping process, students learn about techniques for reaching out to clients, assessing current relationships to determine how to approach an organization, pitching project sponsorship, and determining a project scope. The course includes independent work networking with clients and phone call and video discussions with potential clients.
Prerequisite: BMGT190, ENES190, ENED290 or BMGT290.
Cross-listed with: ENED491.
Restriction: Must be in the QUEST Program (TQMP).
Credit Only Granted for: BMGT491, ENES491 or ENED491.
Formerly: ENES491.

BMGT493 Honors Study (3 Credits)
First semester of the senior year. The course is designed for honors students who have elected to conduct intensive study (independent or group). The student will work under the direct guidance of a faculty advisor and the Assistant Dean of Undergraduate Studies. They shall determine that the area of study is of a scope and intensity deserving of a candidate's attention. Formal written and/or oral reports on the study may be required by the faculty advisor.
Restriction: Permission of BMGT-Robert H. Smith School of Business.

BMGT494 Honors Study (3 Credits)
Second semester of the senior year. The student shall continue and complete the research initiated in BMGT 493, additional reports may be required at the discretion of the faculty advisor and Assistant Dean of Undergraduate Studies.
Prerequisite: BMGT493.
Restriction: Permission of BMGT-Robert H. Smith School of Business; and must be in the Smith School Honors Fellows program.

BMGT495 Strategic Management (3 Credits)
A case-based course where students learn to play the role of the "strategic manager" who defines the scope of its business operations and, within the chosen scope, how the firm will compete against rivals. This course focuses on how a firm can both formulate effective business-level and corporate-level strategies to achieve competitive advantage and earn above average profits.

BMGT496 Business Ethics and Society (3 Credits)
A study of the standards of business conduct, morals and values as well as the role of business in society with consideration of the sometimes conflicting interests of and claims on the firm and its objectives. Emphasizes a strategic approach by business to the management of its external environment.
Prerequisite: 1 course in BMGT; or permission of BMGT-Robert H. Smith School of Business.

BMGT498 Special Topics in Business and Management (3 Credits)
Special topics in business and management designed to meet the changing needs and interests of students and faculty.
Repeatable to: 6 credits if content differs.

BMGT499 Advanced Business Topics (1 Credit)
Course will delve deeply into a specific business topic. Based on experience and knowledge from undergraduate core business classes, students will examine a particular subject from various angles.
Repeatable to: 3 credits if content differs.

BMIN - General Business Minor

BMIN210 Foundations of Accounting for Non Business Majors (3 Credits)
Provides an understanding of the common statements that report a company's profitability and financial health, and are useful to all economic agents who are engaged with the firm. Students will also recognize and understand managerial accounting as a system for accumulating and modeling information to support decision-making.
Restriction: Must not have completed BMGT221; and must not be a major in the Robert H. Smith School of Business.
Credit Only Granted for: (BMGT220 and BMGT221), BMGT210 or BMIN210.
Formerly: BMGT210.
Additional Information: Does not apply to a Smith School degree. Students pursuing a Smith School minor who have completed both BMGT220 and BMGT221 may substitute these courses for BMIN210. Credit will not be given for both BMIN210 and the combination of BMGT220 and BMGT221.

BMIN305 Foundations of Information Systems for Non-Business Majors (3 Credits)
According to the Congressional Research Service, "Technological progress is potentially the most important and hardest to measure source of productivity growth." The technology sector makes up almost 10% of the US GDP and is the largest sector in the S&P 500. Since the mid-1970s, technology has impacted businesses and consumers at a rate of change that is increasing exponentially. Many businesses and consumers cannot fully leverage the potential of technology, and some businesses fail because they cannot match the value their competitors can extract from technology. In this course, we focus on the practices necessary for successfully deploying technology, especially emerging technologies such as artificial intelligence and blockchain, to serve the business. This course enables you to master the use of technology such as AI chatbots and agents for individual productivity as well as acquire the managerial skills to harness the value of technology.
Restriction: Must not have completed BMGT301; and must not be a major in the Robert H. Smith School of Business.
Credit Only Granted for: BMIN305 or BMGT301.
Additional Information: Course does not apply to a Robert H. Smith School of Business degree. BMGT301 may substitute for BMIN305.

BMIN345 Foundations of Financial Management for Non Business Majors (3 Credits)
Provides students an overview of financial management. Students will understand how a business allocates financial resources in an uncertain environment to maximize shareholder value. In addition, students will learn the following: how to apply accounting principles to corporate finance; how to value assets, projects, companies and investment securities; understand the relationship between risk and return and how it impacts investment and corporate decisions; how to calculate a company's cost of capital, and develop an intuitive comprehension of financial concepts and analysis.
Prerequisite: BMIN210, BMGT210 or BMGT220.
Restriction: Must not have completed BMGT340; and must not be a major in the R.H. Smith School of Business.
Credit Only Granted for: BMIN345, BMGT345 or BMGT340.
Formerly: BMGT345.
Additional Information: Course does not apply to a Smith School degree. BMGT340 may substitute for BMIN345.

BMIN355 Foundations of Marketing for Non Business Majors (3 Credits)
Introduces the concepts and principles of marketing. Provides an overview of all the concepts in marketing including relationship marketing, product development, pricing, promotion, marketing research, consumer behavior, international marketing, distribution and internal marketing to employees.
Restriction: Must not have completed BMGT350; and must not be a major in the R.H. Smith School of Business.
Credit Only Granted for: BMIN355, BMGT355 or BMGT350.
Formerly: BMGT355.
Additional Information: Course does not apply to a Smith School degree. BMGT350 may substitute for BMIN355.

BMIN375 Supply Chain Management for Non Business Majors (3 Credits)
Examines management decision-making in the design, implementation and coordination of a firm's supply chain activities. Topics include transportation management, warehousing, materials handling, inventory management, and order fulfillment.
Restriction: Must not have completed BMGT372; and must not be a major in the Robert H. Smith School of Business.
Credit Only Granted for: BMIN375, BMGT375 or BMGT372.
Formerly: BMGT375.
Additional Information: Course does not apply to a Smith School degree. Course may be substituted by BMGT372 for General Business minor students only.

BMIN395 Principles of Management for Non Business Majors (3 Credits)
Introduces concepts related to organization behavior. Topics include leadership, team decision making and management, conflict resolution and negotiations, organizational culture, and organization change. Students will learn how to apply those concepts and theories to understanding and critically analyzing various individual, interpersonal, group, and organizational management processes.
Restriction: Must not have completed BMGT364; and must not be a major in the Robert H. Smith School of Business.
Credit Only Granted for: BMIN395, BMGT395 or BMGT364.
Formerly: BMGT395.
Additional Information: Course does not apply to a Smith School degree. Course may be substituted by BMGT364 for General Business minor students only.

BSCI - Biological Sciences Program

BSCI103 The World of Biology (4 Credits)
An introduction to modern biology for the non-science major. Major themes include molecular biology, cell biology, evolution and organismal biology. Relevance of study of biology to modern human life will be emphasized.
Additional Information: Not acceptable for degree requirements in Biological Sciences, Chemistry, or Biochemistry.

BSCI120 Insects (3 Credits)
A survey of the major groups of insects, their natural history, and their relationships with humans and their environment. Course not acceptable toward major requirements in Biological Sciences, Chemistry or Biochemistry.

BSCI124 Plant Biology for Non-Science Students (3 Credits)
A basic course in plant biology specifically designed for the non-science student. Emphasis is placed on an evolutionary and ecological approach to studying fundamental concepts and processes of plants, their place in the biosphere, the importance of plants to man, and the manner in which humans impact on plants and their environment. This course will not count toward graduation requirements for any student in Biological Sciences, Chemistry, Biochemistry or the College of Agriculture and Natural Resources.
Restriction: For non-science majors only; and must not have completed BSCI105; and must not have completed BSCI170 or BSCI171.
Additional Information: CORE Life Sciences Lab (LL) Course only when taken concurrently with BSCI125.

BSCI125 Plant Biology Laboratory (1 Credit)
An introduction to the biology of plants with emphasis on the processes by which plants function, the diversity of plants, and the importance of plants to humans. This course will not count toward graduation requirements for any student in Biological Sciences, Chemistry, Biochemistry or the College of Agriculture and Natural Resources. CORE Lab Science.
Corequisite: BSCI124.
Restriction: For non-science majors only; and must not have completed BSCI105; and must not have completed BSCI170 or BSCI171.
Additional Information: CORE Life Sciences Lab (LL) Course only when taken concurrently with BSCI124.

BSCI126 Pollinators in Crisis (3 Credits)
How are pollinators threatened by climate change, habitat destruction, and human interaction, and what are some ways to support and protect them? We will dissect the pollinator crisis, and in the process learn about insects, about the interaction of organisms in complex ecosystems, and about the human-nature interface. Students will work in groups that specialize in an aspect of pollinator biology and their challenges. Instruction will target methods for collecting information, interpretation of scientific information and the professional presentation of findings.

BSCI130 Calculus for Life Sciences I (1 Credit)
CALC FOR LIFE SCIENCES I

BSCI135 Amazing Green: Plants that Transformed the World (4 Credits)
In what profound ways have plants changed humanity and the world we live in today? An interactive way to learn about plants and science, focusing on how plants have changed human history, the biology of their growth, and the science behind their use.

BSCI145 The Insect Apocalypse: Real or Imagined? (4 Credits)
Could the ongoing global decline in insect populations portend the end of terrestrial and freshwater ecosystems? An article in the New York Times, in 2018, declared an "Insect Apocalypse" that for the first time brought the general, unexplained declines in insects to the public and suggested a catastrophe awaits our planet. Scientists have documented the loss of insect species at a rate exceeding the extinction rates associated with the major geological events in Earth's history. Based on science and research, students will be provided with background of the diversity of the form and functions of insects, as well as how they evolved and persisted for 400 million years. The course, designed for students of any major, celebrates the incredible variation of insect life and what they do to support life on our planet. The course will highlight the use of scientific research to understand and respond to the global crisis.

BSCI151 Beyond Race: Human Biological Diversity (3 Credits)
Do racial labels have any practical use in understanding human biological diversity? Such categorizations are inextricably linked to racism, including a history of misuse in science going back hundreds of years, yet modern biological research and medicine often include the use of race. At its core, addressing this question requires understanding the balance between genetic and non-genetic factors underlying human diversity. The course will help students make an informed critique of the biological basis of race through the study of topics such as: basic biology, data analysis and experimental design, human evolution and genetics, and biomedical research and health outcomes.
Credit Only Granted for: BSCI189I, BSCI150 or BSCI151.
Formerly: BSCI150.

BSCI155 Learning to Learn biology (4 Credits)
This course focuses on learning, understanding, and working with core ideas in biology to engage in scientific practice and applications. In the spirit of "integrated STEM learning", this course will focus on applications of biological principles particularly as they relate to design solutions for human needs and participation in socioscientific issues. A sub-thread of the course is attention to the content of the Middle School Science Praxis exam sections on "Scientific Inquiry, Methodology, Techniques and History" (a topic that runs through the course) and "Life Sciences" to prepare students in the MSMS major to excel on this section of the Praxis. A laboratory component of the course engages students in investigations using either tangible physical and biological models or computational models. These investigations align with the content structure of the main throughline of the course.
Cross-listed with: TLPL155.
Credit Only Granted for: BSCI155 or TLPL155.

BSCI160 Principles of Ecology and Evolution (3 Credits)
Basic principles of biology with special emphasis on ecological and evolutionary biology.
Prerequisite: Must have math eligibility of MATH120 or higher.
Recommended: For Science majors.
Credit Only Granted for: BSCI106 or BSCI160.
Formerly: BSCI106.

BSCI161 Principles of Ecology and Evolution Lab (1 Credit)
Basic laboratory principles of biology with special emphasis on ecological and evolutionary biology.
Prerequisite: Must have math eligibility of MATH120 or higher.
Corequisite: BSCI160.
Recommended: For Science majors.

BSCI170 Principles of Molecular & Cellular Biology (3 Credits)
Basic principles of biology with special emphasis on cellular and molecular biology.
Prerequisite: Must have math eligibility of MATH120 or higher.
Recommended: For Science majors.
Credit Only Granted for: BSCI105 or BSCI170.
Formerly: BSCI105.

BSCI171 Principles of Molecular & Cellular Biology Laboratory (1 Credit)
Basic laboratory principles of biology with special emphasis on cellular and molecular biology.
Prerequisite: Must have math eligibility of MATH120 or higher.
Corequisite: BSCI170.
Recommended: For Science majors.

BSCI201 Human Anatomy and Physiology I (4 Credits)
Anatomy and physiology of the skeletal, muscular, neural, endocrine, and sensory systems. Course not acceptable toward major requirements in Biological Sciences, Chemistry or Biochemistry.
Prerequisite: Minimum grade of C- in BSCI170; or students who have taken courses with comparable content may contact the CMNS-Biology department.

BSCI202 Human Anatomy and Physiology II (4 Credits)
Anatomy and physiology of the cardiovascular, respiratory, immune, digestive, urinary and reproductive systems. Course not acceptable toward major requirements in Biological Sciences, Chemistry or Biochemistry.
Prerequisite: Minimum grade of C- in BSCI201; or students who have taken courses with comparable content may contact the CMNS-Biology department.

BSCI207 Principles of Biology III - Organismal Biology (3 Credits)
The diversity, structure and function of organisms as understood from the perspective of their common physicochemical principles and unique evolutionary histories.
Prerequisite: BSCI160 and BSCI161; or BSCI106. And BSCI170 and BSCI171; or BSCI105. And must have completed or be concurrently enrolled in CHEM131.

BSCI213 The Public Microbe (3 Credits)
How are microbes essential for human health yet cause so much disease? This course covers basic concepts in microbiology as they relate to human- microbe interactions by surveying the diversity of microbial life, the role our resident microbiota play in human health, modes of disease tracking, and prophylactic and therapeutic measures designed to control the spread of infectious disease.
Credit Only Granted for: BSCI213 or BSCI223.

BSCI222 Principles of Genetics (4 Credits)
Principles and mechanisms of heredity and gene expression. Considers plant, animal, and microbial organisms.
Prerequisite: BSCI170 and BSCI171 or (BIOE120 and BIOE121); and CHEM131 and CHEM132; and either (BSCI160 and BSCI161) or (CHEM231 and CHEM232).

BSCI223 General Microbiology (4 Credits)
How have microorganisms exploited every conceivable ecological niche, and how have humans harnessed this diversity to improve medicine, agriculture, and biotechnology? The course covers fundamental concepts in morphology, physiology, genetics, immunology, ecology, and pathogenic microbiology. Applications of microbiology to medicine, the food industry, and biotechnology.
Prerequisite: BSCI170 and BSCI171; or BSCI105.
Credit Only Granted for: BSCI223 or BSCI283.

BSCI238 Special Topics in Biology Student Initiated Courses (1 Credit)
Student Initiated Course (STIC) in Biology. Course will be student initiated and taught under close supervision of faculty mentor. Student instructor and faculty mentor must generate proposal and have approval of the Biological Sciences Program to offer a BSCI238 STIC. BSCI238 cannot be applied to the degree requirements of any biological sciences major.
Repeatable to: 5 credits if content differs.

BSCI258 College Park Scholars Internship (1-3 Credits)
Credit to be determined by CPS Director. Must be completed by end of sophomore year.
Restriction: For College Park Scholars - Life Sciences students only.
Repeatable to: 6 credits if content differs.
Additional Information: Course not acceptable towards in Biological Sciences, Chemistry, or Biochemistry.

BSCI279 Supplemental Study (1-3 Credits)
Research or special study to complement a course taken previously which is not fully equivalent to current departmental requirements. Credit according to work done.
Prerequisite: Permission of CMNS-Biological Sciences UG Program.
Repeatable to: 6 credits.

BSCI283 Principles of Microbiology (4 Credits)
What makes microorganisms genetically, physiologically, and biochemically unique among organisms in the tree of life? An introduction to microorganisms designed for science majors. Genetic principles underlying microbial abilities; microbial structure-function relationships; metabolism, physiology, and ecology of microorganisms; interactions between microorganisms (including pathogens) and their hosts.
Prerequisite: BSCI222.
Restriction: Must be in a major within Biological Sciences; or permission of CMNS-Cell Biology & Molecular Genetics.
Credit Only Granted for: BSCI223 or BSCI283.
Additional Information: Priority given to BSCI, BCHM and CHEM majors.

BSCI289 Off-Campus Internship (1-3 Credits)
Elective credit for formally established off-campus research internship. Permission of Director of Outreach required.
Prerequisite: Permission of CMNS-Biological Sciences UG Program.
Repeatable to: 5 credits if content differs.
Additional Information: Course not acceptable toward major requirements in the Biological Sciences.

BSCI300 Strategies for Success (1 Credit)
Students often face an increased emphasis on critical thinking, pressure from a typically higher credit hour load, and a faster pace of exposure to new material when moving from lower- to upper-level coursework. The Biological Sciences program designed this course to help all transfer students make successful transitions, both academically and socially, to the University of Maryland at Shady Grove.
Restriction: Must be in a major in USG-Universities at Shady Grove; and must be in Biological Sciences: Physiology & Neurobiology program.
Credit Only Granted for: BSCI300 or BSCI339R.
Formerly: BSCI339R.

BSCI328 Special Topics in Entomology (1-4 Credits)
Lectures, seminars, mini-courses and other special instruction in various entomological subjects.
Repeatable to: 6 credits if content differs.

BSCI329 Instructional Assistance Practicum (1-3 Credits)
Students serve as instructional assistants in selected undergraduate biology courses. Roles and responsibilities are determined on a course-specific basis and approved by the College Undergraduate Program Committee.
Prerequisite: Permission of CMNS-Biological Sciences UG Program.
Repeatable to: 9 credits if content differs.
Additional Information: Course not acceptable toward major requirements in the Biological Sciences.

BSCI330 Cell Biology and Physiology (4 Credits)
Biochemical and physiological mechanisms underlying cellular function. Properties of cells which make life possible and mechanisms by which cells provide energy, reproduce, and regulate and integrate with each other and their environment.
Prerequisite: Minimum grade of C- in CHEM131 and CHEM132. And minimum grade of C- in BSCI170 and BSCI171; or minimum grade of C- in BSCI105.
Restriction: Must not have completed BSCI230.
Credit Only Granted for: BSCI230 or BSCI330.
Formerly: BSCI230.

BSCI333 Principles of Paleontology (4 Credits)
A review of the theory, principles, and applications of Paleontology. A systematic overview of the morphology, evolution, and relationships of the major fossil-producing taxa.
Prerequisite: GEOL102; or (BSCI207 or BSCI392); or permission of CMNS-Geology department.
Cross-listed with: GEOL331.
Restriction: Permission of instructor is required of non-degree seeking students.
Credit Only Granted for: GEOL331 or BSCI333.

BSCI334 Mammalogy (3 Credits)
Introduction to the biology of mammals, including evolution, physiological, and behavioral specializations.
Prerequisite: Minimum grade of C- in BSCI207. And minimum grade of C- in BSCI160 and BSCI161; or minimum grade of C- in BSCI106.

BSCI335 Mammalogy Laboratory (1 Credit)
Lab and field techniques for the study of mammals, focusing on their identification, anatomy, histology, spatial distribution, ecology, and behavior.
Prerequisite: Minimum grade of C- in BSCI160 and BSCI161; or minimum grade of C- in BSCI106. And minimum grade of C- in BSCI207; and must have completed or be concurrently enrolled in BSCI334.

BSCI337 Biology of Insects (4 Credits)
An overview of the biology, evolution and diversity of insects and their relatives. Insect morphology, physiology, behavior and ecology; the impact of insects on humanity and the management of pest insect populations; assembly of an insect collection is required.
Prerequisite: BSCI160 and BSCI161; or BSCI106; or permission of CMNS-Entomology department.

BSCI338 Special Topics in Biology (1-4 Credits)
Lectures, seminars, mini-courses and other special instruction in various biological subjects.
Repeatable to: 9 credits if content differs.

BSCI339 Selected Topics in Biology (1-4 Credits)
Lectures, seminars, and other selected instruction courses in various biological subject matter.
Prerequisite: Permission of CMNS-Biology department.
Repeatable to: 9 credits if content differs.

BSCI342 Biology of Reproduction (3 Credits)
The biology of the reproductive system with emphasis on mammals and, in particular, on human reproduction. Hormone actions, sperm production, ovulation, sexual differentiation, sexual behavior, contraception, pregnancy, lactation, maternal behavior and menopause.
Prerequisite: BSCI170 and BSCI171; or BSCI105; or permission of the Harriet Tubman Department of Women, Gender, and Sexuality Studies; or permission of CMNS-Biological Sciences UG Program.
Cross-listed with: WGSS326.
Credit Only Granted for: BSCI342, WMST326 or WGSS326.
Formerly: WMST326.

BSCI343 Cellular Mechanisms of Aging and Disease (3 Credits)
Explore how alterations in normal cellular and molecular processes lead to both aging and a variety of non-infectious human diseases currently plaguing our society. Students will read, analyze, and discuss current primary and secondary literature in the field of cell biology and biomedicine.
Prerequisite: Minimum grade of C- in BSCI330.
Credit Only Granted for: BSCI339I or BSCI343.
Formerly: BSCI339I.

BSCI348 Special Topics in Cell Biology and Molecular Genetics (1-3 Credits)
Presentation and discussion of special subjects in the field of cell biology and molecular genetics. A maximum of three credit hours of BSCI348 may be applied to the BSCI major.
Repeatable to: 8 credits.
Additional Information: A maximum of 8 credits of any BSCI348 course(s) can be applied to one or more undergraduate degrees. Any credits completed beyond the first 8 will be included in the total earned credits and factored into the GPA but not applied to any undergraduate degree.

BSCI349 Biological Sciences Research Internship (1-3 Credits)
Technical biological sciences research conducted in an off-campus laboratory.
Restriction: Must be in the Biological Sciences major; and permission of instructor.
Repeatable to: 9 credits.
Additional Information: Students must contact the instructor for permission and have an off-campus mentor prior to enrolling in the course.

BSCI353 Cellular and Molecular Neuroscience (3 Credits)
Students will gain an appreciation of neuroscience as the nexus of chemistry, physics, and biology. Additionally, they will gain an understanding of how: both individual and networks of neurons function as variable electrical circuits; our nervous systems transduce signals from the outside world and sets-off molecular cascades; the behavior of a neuron can be changed and or remain the same in response to changing variables. Techniques used to study the nervous system at a cellular and molecular level will be discussed.
Prerequisite: 1 course with a minimum grade of C- from NEUR200, BSCI207 or BSCI330.
Corequisite: Must have completed or be concurrently enrolled in PHYS132 or equivalent course.
Cross-listed with: NEUR306.
Credit Only Granted for: NEUR306 or BSCI353.

BSCI355 Neurobiology of Extraordinary Senses (3 Credits)
From the polarization of light in the sky, to the Earth's magnetic field-- we are surrounded by a universe of invisible cues. Organisms as diverse as bacteria, birds, insects, and fish rely on these hidden stimuli to navigate, communicate and forage. We will explore the organization and function of the extraordinary sensory systems that allow organisms to detect these cues. We will consider both the environmental and evolutionary context within which these sensory systems must function, and the history behind key discoveries in each system. Readings will include primary scientific literature and book chapters. Students will give in-depth presentations on a pre-selected topic, and discuss readings each week in a journal club-style format.
Prerequisite: Minimum grade of C- in BSCI353 or NEUR306.
Credit Only Granted for: BSCI355, BIOL708J or NACS728I.

BSCI357 Neurobiology of Chemosensory Systems (3 Credits)
Chemosensation is essential for all forms of life, orchestrating several physiological processes, such as feeding, sexual behaviors, and body homeostasis. This course will review the function of chemosensory systems, including olfaction, gustatory and central chemoreception, among others. Through lectures and discussion of papers, we will examine the cell biology, systems neuroscience, and evolutionary aspects in these chemosensory systems.
Prerequisite: Minimum grade of C- in BSCI353 or NEUR306.
Credit Only Granted for: BSCI339D, BSCI357, BIOL708Q, or NACS728J.
Formerly: BSCI339D.

BSCI358 Special Topics in Biological Sciences at Shady Grove (1-4 Credits)
Elective credit designed to allow undergraduate students to partake in focused academic experiences, to gain exposure to emerging issues, or to learn specialized content not represented in the main curriculum.
Restriction: Must be a Biological Sciences-Shady Grove major.
Repeatable to: 12 credits if content differs.
Additional Information: Credit cannot be applied to the requirements of any Biological Sciences Major.

BSCI360 Principles of Animal Behavior (3 Credits)
Study of animal behavior with emphasis on its evolution and function. Topics include genetic basis of behavior, communication, aggression, foraging, cooperation, mate selection, and relevance for conservation.
Prerequisite: BSCI160 and BSCI161; or BSCI106. And BSCI170 and BSCI171; or BSCI105. And BSCI222.

BSCI361 Principles of Ecology (4 Credits)
Basic principles of population, community, and ecosystem ecology. Use of these principles to predict possible consequences of human-caused changes in the environment and to understand the level of uncertainty of those predictions.
Prerequisite: BSCI160 and BSCI161; or BSCI106. And (MATH130, MATH136, or MATH140).

BSCI363 The Biology of Conservation and Extinction (3 Credits)
Ecology, evolutionary biology, and paleontology will be applied to the study of conservation, species invasions, and extinction.
Prerequisite: Minimum grade of C- in BSCI361.

BSCI366 Environmental Physiology of Animals (3 Credits)
Explores the physiological, morphological, ecological, and behavioral adaptations of aquatic and terrestrial animals that help them manage environmental challenges. The course considers both diverse adaptations among animal lineages and striking convergence among different animal lineages and systems, as well as the physical laws that drive this convergence. Impacts of climate change on the physiology and ecology of animals are highlighted across the course.
Prerequisite: BSCI207.

BSCI370 Principles of Evolution (3 Credits)
Understanding evolutionary processes in a natural and human environment, including adaptation; DNA sequence, protein, and genome evolution; evolution of developmental mechanisms; mechanisms of evolutionary change (mutation, natural selection, drift); epidemiology; coevolution and biological control; speciation; comparative methods; extinction and conservation; human evolution.
Prerequisite: Minimum grade of C- in BSCI160, BSCI161, and BSCI222 .

BSCI373 Natural History of the Chesapeake Bay (3 Credits)
Consideration of the major groups of organisms associated with the Chesapeake Bay and current issues that determine humans' present and future uses for the Chesapeake and its biota.
Cross-listed with: ENST373.
Credit Only Granted for: BSCI373 or ENST373.

BSCI374 Mathematical Modeling in Biology (4 Credits)
Students will learn empowering mathematical techniques through the understanding of biological models. Models are chosen from a variety of biological disciplines. Mathematical skills that will be developed along the way include: solving non-linear difference equations, eigenvector analysis, and the implementation of these algorithms as computer models.
Prerequisite: MATH131, MATH136, or MATH141.
Cross-listed with: HLSC374.
Credit Only Granted for: BSCI374, BSCI474, or HLSC374.
Formerly: BSCI474.
Additional Information: The HLSC374 version of this course is restricted to students in the Honors College Integrated Life Sciences program.

BSCI378H Cell Biology and Molecular Genetics Department Honors Seminar (1 Credit)
Required seminar for all students participating in departmental honors research program.

BSCI379 Cell Biology and Molecular Genetics Department Research (1-3 Credits)
This course is arranged to provide qualified majors an opportunity to pursue research problems under the supervision of a faculty member of the department.
Prerequisite: Permission of CMNS-Biological Sciences UG Program or Cell Biology & Molecular Genetics department.
Repeatable to: 8 credits.
Additional Information: A maximum of 8 credits of any version of BSCI379 can be applied to one or more undergraduate degrees. Any research credits completed beyond the first 8 will be included in the total earned credits and factored into the GPA but not applied to any undergraduate degree.

BSCI379H Cell Biology and Molecular Genetics Department Honors Research (1-4 Credits)
Student should consult program guidelines. Research project carried out under guidance of faculty advisor.

BSCI381 Molecular Neuroethology (3 Credits)
The brain generates a tremendous variety of behaviors, but how it achieves these feats remains largely unknown. Genetics and molecular tools yield fundamental insights into how the brain senses its environment and determines an appropriate course of action. This course will describe modern genetic manipulations (eg, CRISPR editing) and neuronal interventions (e. g., optogenetics), and discuss the quantification of behavioral outputs. Course consists of lectures plus readings and group discussions of primary scientific literature.
Prerequisite: Minimum grade of C- in BSCI222; and minimum grade of C- in BSCI353 or NEUR306.
Credit Only Granted for: BSCI339W, BSCI381, or BIOL709W.
Formerly: BSCI339W.

BSCI389 Entomology Department Research (1-3 Credits)
Credit to be determined by the department. A maximum of 8 credits of any version of BSCI389 can be applied to one or more undergraduate degrees. Any research credits completed beyond the first 8 will be included in the total earned credits and factored into the GPA but not applied to any undergraduate degree.
Prerequisite: Permission of CMNS-Biological Sciences UG Program.
Repeatable to: 8 credits if content differs.

BSCI392 Biology of Extinct Animals (3 Credits)
A survey of extinct animals that have few, if any, direct living descendants. The principles governing the functional design of animals will be used to infer life styles for extinct, and frequently bizarre, organisms.
Prerequisite: BSCI160 and BSCI161; or BSCI106.
Cross-listed with: GEOL391.
Credit Only Granted for: GEOL391 or BSCI392.

BSCI393 Biology of Extinct Animals Laboratory (1 Credit)
An overview of the techniques used in paleobiological reconstructions of extinct animals.
Prerequisite: Must have completed or be concurrently enrolled in BSCI392.
Cross-listed with: GEOL392.
Credit Only Granted for: GEOL392 or BSCI393.

BSCI398H Biology Department Honors Seminar (1 Credit)
Required seminar for all students participating in departmental honors research program.

BSCI399 Biology Department Research (1-3 Credits)
Research and/or integrated reading in biology under the direction and close supervision of a member of the faculty.
Prerequisite: Permission of the Biology Department.
Restriction: Minimum cumulative GPA of 3.0.
Repeatable to: 8 credits if content differs.
Additional Information: A maximum of 8 credits of any version of BSCI399 may be applied to one or more undergraduate degrees. Any research credits completed beyond the first 8 will be included in the total earned credits and factored into the GPA but not applied to any undergraduate degree.

BSCI399H Biology Department Honors Research (1-2 Credits)
A laboratory research problem; required each semester during honors participation and culminating in an honors thesis.

BSCI400 Animal Diversity and Evolution (3 Credits)
Focuses on deep-level diversity of animals and their evolutionary relationships, unique and repeated transitions in the course of animal evolution, and the evolutionary mechanisms that have shaped and continue to shape animal diversity. The course takes an integrative organismal approach to understanding animal evolution, considering morphology, development, physiology, life history, and ecology. It also explores how patterns of animal diversity have changed through time and the processes affecting animal diversity in our changing world.
Prerequisite: Minimum grade of C- in BSCI160 and BSCI207.

BSCI401 Animal Communication (3 Credits)
Examining the mechanisms by which animal produce and receive signals in each sensory modality; and quantifying the type and amount of information conveyed in signals and how animals attend to such information.
Prerequisite: BSCI160 and BSCI161; or BSCI106. And must have completed one semester of physics; and must have completed one semester of organic chemistry.
Recommended: A course in animal behavior or biopsychology.
Credit Only Granted for: BSCI401, BSCI338W or BIOL708W.
Formerly: BSCI338W.

BSCI403 Biology of Vision (3 Credits)
An upper level undergraduate course on the physical, molecular, and neural basis of vision.
Prerequisite: Minimum grade of C- in BSCI207, NEUR306, or BSCI353.
Recommended: BSCI222.

BSCI404 Cell Biology from a Biophysical Perspective (3 Credits)
An approach to cell biology by focusing on mechanisms and unifying physical paradigms. It will not assume a great deal of factual biological knowledge, but will expect a background that prepares students to think mechanistically and quantitatively.
Prerequisite: BSCI330.
Recommended: PHYS121 and PHYS122; or completion of PHYS131 and PHYS132 recommended. Jointly offered with BIOL704, BIPH704.
Credit Only Granted for: BSCI338O, BSCI404, BIOL704, BIOL708O, or BIPH704.
Formerly: BSCI338O.

BSCI405 Population and Evolutionary Genetics (3 Credits)
Genetic variation within a population provides the basis for future evolution as well as a record of past evolution. The genomics revolution provides data on this variation that, together with mathematical models, allow us to read this record to reconstruct evolutionary trajectories. Examples will focus on hominin and pathogen evolution. In the lab, students will use models to explore how genetic variation (allele frequencies) changes over time and space.
Prerequisite: Minimum grade of C- in BSCI222; and 1 course with a minimum grade of C- from (MATH131, MATH136, MATH141). Jointly offered w ith BIOL709.
Credit Only Granted for: BSCI405, BSCI339J, or BIOL709C.
Formerly: BSCI339J.

BSCI406 Membranes and Biological Interfaces (3 Credits)
An interdisciplinary approach to membrane biology, starting with the physical chemistry of interfaces and model systems and continuing into transport, excitability, and signaling. The course is oriented toward students with broad backgrounds in biology and biophysics. Success in the course will come from a background that prepares students to think mechanistically and quantitatively rather than having substantial factual biological knowledge.
Prerequisite: Minimum grade of C- in BSCI330.
Recommended: PHYS122; or PHYS132; or (PHYS260 and PHYS261).
Credit Only Granted for: BSCI339R, BSCI406, or BIOL709R.
Formerly: BSCI339R.

BSCI407 Behavioral Genetics (3 Credits)
Behavior represents an organism's most dynamic phenotype and allows an animal to respond immediately to both internal and external cues. We will explore the genetic and epigenetic mechanisms that underlie behavioral variation and the associated neurological, hormonal, and developmental pathways. We will examine modern approaches used to study behavioral genetics in model and non-model systems, and in humans. Using case studies, we will explore a range of complex phenotypes including those related to mating, parental care, aggression, circadian rhythm, locomotion, learning, anxiety, and addiction.
Prerequisite: Minimum grade of C- in BSCI222.

BSCI410 Molecular Genetics (3 Credits)
An advanced genetics course emphasizing the molecular basis of gene structure and function in the context of modern approaches to the genetics of humans and model organisms.
Prerequisite: BSCI222. And must have completed CHEM233; or (CHEM231 and CHEM232).

BSCI411 Bioinformatics and Integrated Genomics (4 Credits)
Computational methods for the study of biological data. Pairwise and multiple sequence alignment, genome assembly and annotation, RNAseq analysis, and structural bioinformatics. Introduction to UNIX, Python, and R in the context of biological sequence data. Previous computational experience is not necessary.
Prerequisite: Minimum grade of C- in BSCI222.
Recommended: BSCI410.
Credit Only Granted for: BSCI380 or BSCI411.
Formerly: BSCI380.

BSCI412 Microbial Genetics (4 Credits)
A laboratory/lecture based course that covers the fundamentals of mutation, mobile genetic elements and transmission genetics of microbial organisms using both classical and molecular approaches.
Prerequisite: BSCI222; and (BSCI223 or BSCI283).

BSCI413 Recombinant DNA (3 Credits)
An advanced course presenting the tools and procedures of genetic engineering. Theory and practical applications of recombinant DNA techniques to understanding eukaryotic gene structure and expression.
Prerequisite: BSCI330, BSCI223, or BSCI230; and BSCI222.
Formerly: ZOOL452.

BSCI414 Recombinant DNA Laboratory (3 Credits)
An advanced course offering hands-on experience in performing recombinant DNA experiments. All current molecular biology techniques used for cloning prokaryotic genes, analyzing the gene products, and modifying the genes will be performed. Techniques include isolation of DNA, use of restriction enzymes; cloning procedures, PCR analysis, and Southern hybridizations. Lecture material focuses on interpretation of results generated in the laboratory.
Prerequisite: BSCI222.

BSCI415 Molecular Genetics Laboratory (3 Credits)
Problem solving laboratory organized around extended projects that employ different approaches toward linking gene and function.
Prerequisite: Must have completed or be concurrently enrolled in BSCI410.
Restriction: Junior standing or higher.
Credit Only Granted for: BSCI348G or BSCI415.
Formerly: BSCI348G.

BSCI416 Human Genetics (3 Credits)
Approaches to human genetics and applications to biology and medicine focusing on specific human genetic topics using primary research papers as the main resource.
Prerequisite: Minimum grade of C- in BSCI410.
Recommended: BSCI330.

BSCI417 Microbial Pathogenesis (3 Credits)
Current research in microbial pathogenesis and the molecular and cellular basis of bacterial disease. Comprehensive overview of the molecular basis of pathogenesis with a focus on model microbial systems to illustrate mechanisms of disease pathogenesis. Topics covered: how microorganisms attach to and enter cells; how host cells are damaged by microbial products; how the host responds to invasion; and host-pathogen evolution.
Prerequisite: BSCI222; and (BSCI223 or BSCI283).
Restriction: Junior standing or higher.

BSCI420 Cell Biology Lectures (3 Credits)
Molecular and biochemical bases of cellular organization and function in eukaryotes.
Prerequisite: BSCI330, BSCI222, CHEM231, and CHEM232.
Credit Only Granted for: BSCI420 or BSCI421.

BSCI422 Principles of Immunology (3 Credits)
The immune system in health and disease. Presentation and analysis of the cellular and molecular processes that comprise the immune system.
Prerequisite: BSCI222.
Recommended: BSCI330; and (BSCI223 or BSCI283).
Restriction: Junior standing or higher.

BSCI423 Immunology Laboratory (2 Credits)
Current techniques for assessment of immune status and evaluation of the immune response, including monoclonal antibody production, Western blotting, cytokine assays, ELISA and flow cytometry.
Prerequisite: BSCI222.
Corequisite: BSCI422.
Recommended: BSCI223 or BSCI283.
Restriction: Junior standing or higher.

BSCI424 Pathogenic Microbiology (4 Credits)
The role of bacteria and fungi in the diseases of humans with emphasis upon the differentiation and culture of microorganisms, types of disease, modes of disease transmission, prophylactic, therapeutic, and epidemiological aspects.
Prerequisite: BSCI223 or BSCI283.

BSCI425 Advanced Cell Biology Lab Practices (2 Credits)
Experimental techniques used to study the molecular, structural, and spatial organization of plant and animal cells. Using a combination of in vitro assays aimed at analyzing macromolecular and subcellular components and in vivo analyses designed to reveal the inner architecture of a typical eukaryotic cell, students will have an opportunity to: improve some of the basic technical and conceptual skills they acquired in an introductory cell biology course; develop a more sophisticated understanding of the nature of experimental cell manipulation; and tackle the ongoing challenge of articulating their findings in both written and oral communication.
Prerequisite: Must have completed BSCI330, BSCI222, CHEM231, and CHEM232; and must have completed or be concurrently enrolled in BSCI420.
Credit Only Granted for: BSCI421, BSCI425, or BSCI348C.

BSCI426 Global Change Biology (3 Credits)
Explore the biology of past, present and future global change and its impacts on the diversity of life. Focus on mechanisms of global change; organismal responses to that change, examples of past change, estimates of future change, and approaches to mitigation.
Prerequisite: Minimum grade of C- in BSCI207.
Recommended: BSCI361 and BSCI370.

BSCI430 Developmental Biology (3 Credits)
Structural, functional and regulatory events and mechanisms that operate during development to produce an integrated, multicellular organism composed of a multitude of differentiated cell types.
Prerequisite: BSCI222 and BSCI330.

BSCI431 The Origin and Evolution of Nervous Systems (3 Credits)
Explore how brains change through evolution along the animal tree of life. By comparing the nervous system structure and development across the animal kingdom, this course aims to reveal common designs and mechanisms that generate behavior, and to inform our understanding of how biology builds minds. Topics include the origins of neurons, the universal molecular patterning of brain development across invertebrates and vertebrates, the evolution of neurotransmission, comparative mechanisms of learning and memory, and what in our brain makes us human.
Prerequisite: Minimum grade of C- in NEUR200 or BSCI207.

BSCI432 Systems View of Cell Biology (3 Credits)
An integrated understanding of cell biology based upon reading of literature, discussion of new findings, and quantitative simulations. Exploration of ten topics including Heredity, Curing Diseases, and Synthesizing Life.
Prerequisite: BSCI330.

BSCI433 Biology of Cancer (3 Credits)
Causes and consequences of neoplastic transformations at the biochemical and cellular levels.
Prerequisite: BSCI222 and BSCI330; or permission of CMNS-Biological Sciences UG Program.

BSCI436 RNA Biology and Therapeutics (3 Credits)
The prediction of RNA structure from its sequence, and how the many types of cellular and viral RNAs function in and regulate cellular processes. Use of RNA-based drugs for controlling disease through RNA targeting, editing and vaccines.
Prerequisite: 1 course from (BSCI330, BSCI331, BSCI230); and 1 course from (BSCI222, HLSC322).
Recommended: BSCI410.
Restriction: Must have junior standing or higher.

BSCI437 General Virology (3 Credits)
Discussion of the physical and chemical nature of viruses, virus cultivation and assay methods, virus replication, viral diseases with emphasis on the oncogenic viruses, viral genetics, and characteristics of the major virus groups.
Prerequisite: BSCI222; or permission of CMNS-Biological Sciences UG Program.
Restriction: Junior standing or higher.

BSCI439 Undergraduate Advanced Selected Topics in Biology (1-4 Credits)
Lectures, seminars, mini-courses, and other special instruction in various biological subjects.
Repeatable to: 9 credits if content differs.

BSCI440 Mammalian Physiology (4 Credits)
A study of the cardiovascular, hemopoietic, gastrointestinal, renal and respiratory systems. Chemical and endocrine regulation of physiological functions in mammals. Course does not count as an upper level lab for BIOL majors (see BSCI441).
Prerequisite: BSCI330; and (CHEM231 and CHEM232; or must have completed CHEM233). Or permission of CMNS-Biological Sciences UG Program.
Credit Only Granted for: BIOE340, BSCI440, or BSCI450.

BSCI441 Mammalian Physiology Laboratory (2 Credits)
Laboratory exercises in experimental mammalian physiology.
Prerequisite: Must have completed or be concurrently enrolled in BSCI440.
Credit Only Granted for: BSCI441 or BSCI451.

BSCI442 Plant Physiology (4 Credits)
An in-depth examination of the unique molecular and physiological principles necessary to understand how plants grow and respond to the environment at the cellular and organismal levels. Plants evolved unique metabolism and survival strategies, so students should be prepared to enter a world that may be new to them.
Prerequisite: Minimum grade of C- in BSCI170 and BSCI171; or minimum grade of C- in PLSC201; and minimum grade of C- in CHEM231 and CHEM232; or minimum grade of C- in CHEM237.
Cross-listed with: PLSC400.
Credit Only Granted for: BSCI442 or PLSC400.

BSCI443 Microbial Physiology (3 Credits)
Microbial cellular and population growth. Fermentation metabolism, physiology of anaerobiosis, and energy conservation and transformation in bacterial membranes. Efficiency of energy utilization for growth. Membrane structure and transport. Bacterial motility and chemotaxis. Regulation of bacterial chromosome replication, RNA and protein synthesis. Control of metabolic pathways. Bacterial stress responses. Antimicrobials.
Prerequisite: Minimum grade of C- in BSCI223 or BSCI283; and minimum grade of C- in BCHM461 or BCHM462.

BSCI446 Advanced Systems Neuroscience (3 Credits)
Neural development, neurobiology of sensation and perception, motor and integrative systems organization in the central nervous system. Neural systems dysfunction as related to medical pathologies and discussion of contemporary neuroscience methods used to understand brain function.
Prerequisite: Minimum grade of C- in BSCI353 or NEUR306.

BSCI447 General Endocrinology (3 Credits)
Functions and dysfunctions of the endocrine system with special reference to mammals.
Prerequisite: BSCI330, CHEM241, and CHEM242.

BSCI450 Mammalian Systems Physiology (3 Credits)
A study of the cardiovascular, hemopoietic, gastrointestinal, renal, and respiratory systems. Chemical and endocrine regulation of physiological functions in mammals.
Prerequisite: Minimum grade of C- in BSCI330; and minimum grade of C- in CHEM233 or both CHEM231 and CHEM232.
Credit Only Granted for: BIOE340, BSCI440, or BSCI450.

BSCI451 Mammalian Systems Physiology Laboratory (2 Credits)
Laboratory exercises in experimental mammalian physiology.
Prerequisite: Must have completed with a minimum of C- or be concurrently enrolled in either BSCI440 or BSCI450.
Credit Only Granted for: BSCI441 or BSCI451.
Formerly: BSCI441.

BSCI452 Diseases of the Nervous System (3 Credits)
An advanced course covering the neuroanatomy, function, and organization of the nervous system and its implication for pathology and disease.
Prerequisite: Minimum grade of C- in BSCI330; and must have completed with a minimum of C- or be concurrently enrolled in either BSCI353 or NEUR306.
Credit Only Granted for: BSCI452, BIOL708E, or NACS728N.

BSCI453 Biology of Hearing (3 Credits)
Acoustic and neural basis of hearing. The auditory system will be described with a comparative approach across species.
Prerequisite: Minimum grade of C- in BSCI207 or NEUR200.
Recommended: BSCI353 or NEUR306.

BSCI454 Neurobiology Laboratory (2 Credits)
Basic neuroanatomical techniques, intracellular and extracellular recordings of electrical potentials from nerve and muscle.
Prerequisite: Minimum grade of C- in BSCI330; must have completed or be concurrently enrolled in BSCI353; and must have completed or be concurrently enrolled in PHYS122, PHYS132, or PHYS142.
Credit Only Granted for: BSCI454, BSCI455, NEUR405, or PSYC401.

BSCI455 Neuroscience Laboratory (3 Credits)
Students will utilize neurophysiological techniques to examine fundamental principles of neurons and neural circuits. This course will reinforce content from prerequisite NEUR courses. Students will also strengthen skills in experimental design and scientific writing.
Prerequisite: NEUR306 or BSCI353; and PHYS132.
Recommended: NEUR305.
Cross-listed with: NEUR405.
Credit Only Granted for: PSYC401, NEUR405, BSCI455 or BSCI454.

BSCI456 Advanced Cellular Neuroscience (3 Credits)
Readings and discussion in cellular and molecular mechanisms underlying synaptic structure/function relationships, synaptic potentiation/depression, dendritic integration, homeostatic plasticity, and nervous system development including neurogenesis, axon guidance, synaptogenesis, and activity-dependent development among other topics.
Prerequisite: Minimum grade of C- in BSCI353 or NEUR306.
Recommended: Minimum grade of C- in BSCI440 or another upper-level neuroscience course.
Jointly offered with: NACS644.
Restriction: Permission of CMNS-Biology department.
Credit Only Granted for: BSCI339X, BSCI456, or NACS644.
Formerly: BSCI339X.

BSCI462 Population Ecology (3 Credits)
Theory of population growth and regulation, life tables, and theory of competition and predation, evolution in ecological settings, community structure and dynamics.
Prerequisite: MATH130, MATH136, or MATH140; and BSCI361.

BSCI464 Microbial Ecology (3 Credits)
Interaction of microorganisms with the environment, other microorganisms and with higher organisms. Roles of microorganisms in the biosphere. Microorganisms and current environmental problems.
Prerequisite: BSCI223 or BSCI283; and (CHEM271 or CHEM277); or permission of the instructor.

BSCI467 Freshwater Biology (4 Credits)
Biology and ecology of freshwater invertebrates in lotic and lentic habitats, their adaptation to aquatic life, their function in aquatic ecosystems, and their relationship to environmental deterioration. Laboratory will include field trips, demonstrations, and identifications.
Prerequisite: BSCI160.

BSCI471 Molecular Evolution (3 Credits)
Patterns of DNA sequence variation within and between species, caused by nucleotide changes and the movement of transposable elements. Theories of molecular evolution, such as the neutral theory. Molecular clock hypothesis: its importance as a practical empirical tool in molecular genetics and systematics and its theoretical foundation.
Prerequisite: BSCI222; or permission of CMNS-Biology department.

BSCI473 Marine Ecology (3 Credits)
Courses in evolution and animal behavior are strongly recommended. A detailed analysis of the evolutionary ecology of marine invertebrates; emphasis on testing of theories and on current literature.
Prerequisite: BSCI207.

BSCI475 Sexual Selection in Nature (3 Credits)
Sexual selection drives some of the most spectacular, if not bizarre, traits in nature. We will explore how organisms select and compete for mates and fertilization success, and how this powerful and pervasive evolutionary force shapes sexual traits and regulates species boundaries. We will focus on the key theories in the field and discuss recent and classic research papers. This is a student-directed class: course topics and materials will be selected based on student interests and involvement. On occasion, experts in the field will be invited to class to discuss their research.
Prerequisite: Minimum grade of C- in BSCI207; or permission of instructor.
Recommended: BSCI360 or BSCI370. Jointly offered with BIOL708.
Credit Only Granted for: BSCI338X, BSCI475, or BIOL708X.
Formerly: BSCI338X.

BSCI476 Evolutionary Genomics (3 Credits)
Application of genomics to understanding evolutionary processes, including genome evolution, organismal evolution, genomic diversity across the tree of life, human evolution and disease. Relevant concepts of evolutionary genetics and genome biology will be covered.
Prerequisite: Minimum grade of C- in BSCI222.
Recommended: BSCI370.
Credit Only Granted for: BSCI476 or BIOL708C.

BSCI477 Ecology and Evolution of Infectious Disease (3 Credits)
Parasites are a ubiquitous feature of ecological communities, and can strongly impact population growth, extinction risk, community structure and biodiversity, as well as pose serious risks to human health and food security. This course will cover basic principles of disease ecology, including; the diversity of parasitic organisms and transmission modes, host and pathogen traits for defense and infection, mathematical models of disease spread, the impacts of disease at different ecological scales, and host-parasite co-evolution. In the latter half of the course we will apply these basic concepts to current real-world problems in disease ecology including emerging infectious diseases in humans, wildlife and agriculture. We will use examples from plants, animals and humans to about an equal degree. This course will have a strong quantitative focus, and completion of the math series is recommended.
Prerequisite: C- or better in either BSCI370 or BSCI361 and either MATH136 or MATH140.
Credit Only Granted for: BSCI477 or BIOL708D.

BSCI480 Arthropod Form and Function (4 Credits)
Survey of the morphological, systematic and physiological diversity of the phylum Arthropoda.
Prerequisite: Permission of CMNS-Entomology (AGNR).

BSCI481 Insect Diversity and Classification (4 Credits)
A summary of the morphology, systematics and evolution of insects and techniques for their collection, preservation and identification. Emphasis is placed on the diversity of insects in North America, particularly Maryland and adjacent regions. An insect collection is required.
Prerequisite: BSCI337.

BSCI482 Insect Physiology and Molecular Biology (4 Credits)
Physiological and biochemical functions of insects. Insect endocrinology, neurobiology, sensory physiology, integument and molting, development and metamorphosis, immunity, metabolism and related topics.
Prerequisite: BSCI337.

BSCI483 Insects, Pathogens, and Public Health (3 Credits)
Explores how mosquitoes, ticks, and other blood-feeding arthropods shape human and animal health, from direct injury to the spread of globally important vector-borne diseases.
Prerequisite: BSCI207.

BSCI487 IPM: Science-Based Decision Making for Sustainable Pest Management (4 Credits)
Long-term global food security requires a sustainable increase in agricultural productivity to ensure the availability and accessibility of safe and nutritious food. Agricultural pests reduce global food production and threaten its sustainability. This course explores sustainable pest management in agroecosystems using the integrated pest management (IPM) paradigm. IPM is an ecosystem-based strategy that focuses on long-term prevention of pests or their damage through a combination of techniques such as biological control, habitat manipulation, modification of cultural practices, and use of resistant varieties. Pesticides are used only after monitoring indicates they are needed according to established guidelines, and treatments are made with the goal of removing only the target organism. Pest control materials are selected and applied in a manner that minimizes risks to human health, beneficial and non-target organisms, and the environment.
Prerequisite: BSCI160 and BSCI161.
Restriction: Must have earned a minimum of 90 credits.
Credit Only Granted for: BSCI487 or ENTM609.

BSCI488 Summer Biology Institutes (1-8 Credits)
Prerequisite: Permission of CMNS-Biological Sciences UG Program.
Repeatable to: 12 credits if content differs.

BSCI494 Animal-Plant Interactions (3 Credits)
Theoretical, conceptual and applied aspects of evolutionary and ecological interactions between plants and animals. This course gives an overview of major ideas, historical controversies, and current research on animal-plant relationships. We will explore the mechanisms and evolution of plant defenses and animal counter-adaptations, behavioral ecology and interactions across trophic levels, the role of microbial communities in mediating interactions, and how these interactions color human experience through food and medicine. The course will have a blended lecture/discussion format and will include field walks to collect herbivory data and observe animal-plant interactions.
Prerequisite: BSCI160 and BSCI161; or BSCI106.

BSCI497 Insect Pests of Ornamentals and Turf (4 Credits)
The recognition, biology and management of insects and mites injurious to ornamental shrubs, trees, greenhouse crops, and turf. Emphasis on Integrated Pest Management (IPM).
Prerequisite: BSCI160 or BSCI337; or (PLSC110 and PLSC111) or (PLSC112 and PLSC113).

BSOS - Behavioral and Social Sciences

BSOS138 Special Topics in Study Abroad I (1-6 Credits)
Special topics course taken as part of an approved study abroad program.
Repeatable to: 15 credits if content differs.

BSOS180 Introduction to Data Management (1 Credit)
Learn to read data, clean data sets, and perform other vital functions (mainly in Excel). Students will develop fundamental skills that will ease the transition into future coursework (or a career) in data science or analytics. Designed for students who have minimal background in Excel or computer software.
Restriction: Must be in a major within the College of Behavioral and Social Sciences or the College of Information.
Credit Only Granted for: BSOS180 or BSOS188B.
Formerly: BSOS188B.
Additional Information: Recommended for BSOS majors who need additional support for their disciplinary stats or research methods sequence.

BSOS188 Selected Topics in the Behavioral and Social Sciences (1-3 Credits)
Introductory selected topics course dealing with interdisciplinary issues related to the social sciences.
Repeatable to: 6 credits if content differs.
Credit Only Granted for: EDCP108O or BSOS188A.

BSOS201 Ensuring your Financial Future Through Stock Investing (3 Credits)
Introduces students to investing and trading, with special emphasis on the field of technical analysis. Planning for one's financial future is a critical skill for all students. Students will learn how to evaluate companies using the investors.com website and the TC2000 stock charting program. Students will develop an idea of the risks and benefits of investing, establishing a savings strategy, opening an IRA, and strategically planning for future financial security. In addition to readings, lectures, and online videos, students will participate in virtual stock market trading exercises and manage a virtual account.
Credit Only Granted for: BSOS289I or BSOS201.
Formerly: BSOS289I.
Additional Information: No prior knowledge of the stock market or investing is expected or required.

BSOS230 Introduction to Programming for the Social Sciences: Statistical Computing using R (1 Credit)
R is an open-source programming language, specialized for statistical computing, and provides a variety of statistical and graphical techniques that might be relevant for any BSOS program, such descriptive statistics, linear and non-linear regression, text mining, image processing. The R language is increasingly often employed in advanced statistics and data analytics, offering a wide range of application packages for effective programming. This course introduces the R language and several powerful packages in form of lectures, worked-out examples, and group exercises.
Restriction: Must not have completed BSOS330; and must be enrolled in a BSOS major. Or permission of instructor.
Additional Information: Students do not need any prior experience using R.

BSOS231 Introduction to Programming for the Social Sciences: Python (1 Credit)
Python has become the most powerful programming language in advanced statistics and data analytics. It includes expansive packages for data handling and processing, including the latest developments in machine learning, and offers Integrated Development Environments (IDE) for code development, testing, debugging, and graphical representation. In addition, python is deployed on virtually all high performance computing clusters, taking advantage of multi-processing, large memory, and GPU enhanced computing environments. This course offers a thorough introduction to python and those packages that are fundamental to data processing and analysis, image processing, natural language processing, machine learning.
Restriction: Must not have completed BSOS331; and must be enrolled in a BSOS major. Or permission of instructor.
Additional Information: Students do not need any prior experience using Python.

BSOS233 Data Science for the Social Sciences (3 Credits)
An introduction to modern methods of data analysis for social scientists. This course emphasizes teaching students who have no previous coding experience how to analyze data and extract meaning in a social science context. Students will gain critical programming skills and learn inferential thinking through examples and projects with real-world relevance.
Prerequisite: Must have completed or be concurrently enrolled in STAT 100.
Restriction: Must be in a major in the College of Behavioral and Social Sciences or the College of Information Studies; or permission of instructor.

BSOS238 Special Topics in Study Abroad II (1-6 Credits)
Special topics course taken as part of an approved study abroad program.
Repeatable to: 15 credits if content differs.

BSOS240 The Problem of Prejudice: Overcoming Impediments to Global Peace and Justice (3 Credits)
What is prejudice? How are our prejudices formed? What similarities and differences are there between various forms of prejudice across race, gender, nationality, politics, religion, among others? What is the relationship between prejudice and conflict? What is the role of prejudice in thinking about issues of peace and justice? How can we better understand the role that prejudice and discrimination have in a globalizing world? What can we learn from a scientific basis of knowledge about the causes of prejudice? This course will survey interdisciplinary scholarly research and popular cultural conversations about the root causes of prejudice and discrimination. You are expected to examine empirical evidence toward formulating your own views about the impact that all forms of prejudice impose on the human condition and the role it has played in your own life. Based on research evidence, the course encourages the search for solutions to the blight of prejudice.
Credit Only Granted for: BSOS240, HNUH228Z, or HONR279L.
Formerly: HNUH228Z and HONR279L.

BSOS248 Leadership Seminar I (1-6 Credits)
A topics course in the behavioral and social sciences designed to develop student leaders with skills that will address important issues of the college and offers diverse viewpoints intended to challenge common perceptions of leadership, technology programs and communication.
Repeatable to: 9 credits.

BSOS258 Leadership Practicum I (1-6 Credits)
This course puts into practice the elements and skills learned in the seminar series that directly benefit the college.
Repeatable to: 9 credits.

BSOS288 Special Topics in Behavioral and Social Sciences (1-3 Credits)
Introductory special topics course focusing on an interdisciplinary topic related to behavioral and social sciences.
Repeatable to: 6 credits if content differs.

BSOS308 Contemporary Issues: Interdisciplinary Approaches (3 Credits)
An interdisciplinary analysis of current public policy issues of international, national and community import. Senior standing recommended.
Recommended: Must have Senior standing.
Repeatable to: 6 credits if content differs.

BSOS326 Python Programming for the Social Sciences (3 Credits)
Python has become the most powerful programming language in advanced statistics and data analytics. It includes expansive packages for data handling and processing, including the latest developments in machine learning, and offers Integrated Development Environments (IDE) for code development, testing, debugging, and graphical representation. This course offers a thorough introduction to Python and those packages that are fundamental to data processing and analysis.
Prerequisite: Minimum grade of C- in INST126 or BSOS233.
Restriction: Restricted to students in the Social Data Science major or by permission of the instructor.

BSOS338 Special Topics in Study Abroad III (1-6 Credits)
Special topics course taken as part of an approved study abroad program.
Repeatable to: 15 credits if content differs.

BSOS348 Leadership Seminar II (1-6 Credits)
A topics course in the behavioral and social sciences designed to develop student leaders with advanced skills that will address important issues of the college and offers diverse viewpoints intended to challenge common perceptions of leadership, technology programs and communication.
Repeatable to: 9 credits.

BSOS355 Social Sciences Internship Practicum (3 Credits)
BSOS 355 is an internship course open to all majors. It will enable students to articulate and apply the scholarship from the discipline related to their specific internship placement into a real-work environment.
Restriction: Must have earned a minimum of 60 credits; and minimum cumulative GPA of 2.5; and must have completed at least 1 semester at UMD.
Credit Only Granted for: BSOS388I or BSOS355.
Formerly: BSOS388I.

BSOS358 Leadership Practicum II (1-6 Credits)
This course puts into practice the advanced skills and elements learned in the seminar series that directly benefit the college.
Repeatable to: 9 credits.

BSOS361 Academic and Career Planning for Transfer Students in the College of Behavioral and Social Sciences (1 Credit)
Students will utilize the resources of the Feller Center for Academic and Career Planning and TerrapinSTRONG to explore how their individual social identities and strengths contribute to building strong communities in personal, academic, and professional career spaces.
Restriction: Must be a first-semester transfer student in a College of Behavioral and Social Sciences major.
Additional Information: Intended for first semester transfer students in BSOS majors.

BSOS385 Big-Data Analysis on the BSOS HPC Cluster (2 Credits)
Social media are a primary source of information on social interaction and personal interests. High-performance computing (HPC) is employed to search for hidden pattern and unknown correlations using advanced machine-learning algorithms available in python and R packages. The main steps of Natural Language Processing and big-data analysis are being worked out, from examining random samples to analyzing large data sets via in-memory Monte-Carlo applications and neural networks.
Prerequisite: Students must have completed a least one college-level statistics course.
Recommended: A working knowledge of python or R is expected.
Restriction: Students must be enrolled in a BSOS major; or permission of instructor.
Credit Only Granted for: BSOS385, BSOS685, or BSOS688B.

BSOS386 Experiential Learning (3-6 Credits)

BSOS388 Behavioral and Social Sciences Special Topics (1-3 Credits)
Advanced special topics course focusing on an interdisciplinary topic related to the Behavioral and Social Sciences.
Repeatable to: 6 credits if content differs.

BSOS399 Directed Study in Behavioral and Social Sciences (1-6 Credits)
Guidance for the advanced student capable of interdisciplinary study on special projects under the supervision of the Assistant Dean for Student Affairs.

BSOS438 Special Topics in Study Abroad IV (1-6 Credits)
Special topics course taken as part of an approved study abroad program.
Repeatable to: 15 credits if content differs.

BSOS448 Teaching Assistant Practicum (1-6 Credits)
Supervised practicum for teaching assistants for BSOS/UNIV courses.
Repeatable to: 9 credits.

BSST - Terrorism Studies

BSST200 Terrorism Studies (3 Credits)
Theories explaining the formation of terrorist groups and the motivations behind terrorist behavior, building upon theories from social psychology, sociology, political science, criminology, and history. The course examines the different levels of analysis for terrorism studies, the different methods scholars utilize for research, and the most prominent datasets in the field of homeland security. In addition, this course provides a review of various terrorist groups and ideological movements. The course concludes with an introduction to the different approaches to counter violent extremism and terrorism.
Credit Only Granted for: BSST330 or BSST200.
Formerly: BSST330.

BSST240 Understanding The Principles and Perils of CBRN Weapons (3 Credits)
Explores the 'dark side' of scientific applications. Students will gain an understanding of CBRN Weapons, through the exploration of the scientific method, and certain fundamental principles of chemistry, biology, and physics. Students will also learn how to test hypotheses, use basic statistics, interpret results, and apply their new knowledge through discussions of practical applications in the domains of public health, emergency management, epidemiology, and threat assessment. Bringing these fields together in one class will allow students to better understand the use of and threat from CBRN weapons in terrorism.
Additional Information: If taken in the same term as BSST241 these courses will count for General Education Natural Sciences Lab.

BSST241 Understanding the Principles and Perils of CBRN Weapons (Lab) (1 Credit)
An exploration of the threat of Chemical, Biological, Radiological, and Nuclear (CBRN) weapons aimed to provide students with a basic, multidisciplinary, natural science foundation in chemistry, biology, and physics.
Corequisite: BSST240.
Additional Information: This is an optional 1-credit lab course offered in coordination with BSST240. If taken in the same term as BSST240 these courses will count for General Education Natural Sciences Lab.

BSST258 Special Topics in Study Abroad II (1-6 Credits)
Special topics course taken as part of an approved study abroad program.
Repeatable to: 15 credits if content differs.

BSST288 Special Topics in Terrorism Studies (3 Credits)
A special topics course for students in the Global Terrorism Minor program. Topics that may be offered are Psychology of Terrorism; Development of Counterterrorism Policies and Programs; Terrorism and Popular Culture; Terrorism and the Media; International Perspective on Terrorism and Counterterrorism (Education Abroad); The Evolution of Hezbollah; Terrorism and Small Wars; Political Islam in the West.
Repeatable to: 9 credits if content differs.

BSST331 Innovations in Counterterrorism (3 Credits)
Explore the manners in which states respond to terrorist incidents and the threat of terrorism through counterterrorism approaches and strategies. We will examine counterterrorism responses from law enforcement, military, and the intelligence community. This will include discussions about policy decisions made in response to both terrorist attacks and the threat of terrorism. Counterterrorism strategies this course will cover include deterrence, interdiction, and legal efforts to combat terrorism, including terrorist financing and online recruitment. The course is divided into four general parts. First, we will provide an overview of government counterterrorism options and review key concepts. Second, we will examine law enforcement responses to terrorism including efforts to counter cyberterrorism, social media recruitment, and terrorist financing online. Third, we will focus on military responses to attacks conducted by terrorist groups, including deterrence strategies, targeted strikes, and covert operations. Last, we will review the challenges and complexities of counterterrorism approaches, including the ethical, moral, and legal dilemmas.
Restriction: Must be in the Terrorism Studies minor program.

BSST334 States of Emergency (3 Credits)
Students will explore the manner in which crises unfold from the perspective of a variety of emergency response disciplines, including: emergency management, law enforcement, intelligence analysis, cyber analysis, risk communication, health and human services, and emergency psychiatry/psychology. Students will participate in a semester-long simulation of an unfolding terrorist attack.

BSST335 Innovations in Countering Violent Extremism (3 Credits)
Introduces students to novel innovations in the development of Countering Violent Extremism (CVE) programs. CVE is a realm of policy, programs, and interventions designed to prevent individuals from engaging in violence associated with radical political, social, cultural, and/or religious ideologies. Unlike counterterrorism strategies that often focus on targeting and disrupting terrorist plots, CVE focuses on radicalization prevention through engagement and intervention with communities. CVE also focuses on deradicalization and rehabilitation of former extremists. Throughout the course, students will work in groups to develop their own innovative CVE programs, rather than merely learn about CVE through lectures.
Restriction: Must be in the Global Terrorism Studies Minor program.
Credit Only Granted for: BSST335 or BSST338V.
Formerly: BSST338V.
Additional Information: It is recommended that BSST335 be taken after, or concurrent with, BSST200.

BSST337 Ideology and Social Conditions in the Making of Terrorism (3 Credits)
This class focuses on the relations of ideology with social conditions in the historical context of the Middle East and North Africa in order to explain the process of the rise and domination of Islamist extremism and suicide terrorism as a dominant oppositional discourse in the region. Resting on a cognitive conception of ideology, this class focuses on the process in which ideological discourses shape the making of the terrorist mind.
Credit Only Granted for: BSST338G or BSST337.
Formerly: BSST338G.

BSST338 Special Topics in Terrorism Studies (3 Credits)
A special topics course for students in the Global Terrorism Minor program. Topics that may be offered are Psychology of Terrorism; Development of Counterterrorism Policies and Programs; Terrorism and Popular Culture; Terrorism and the Media; International Perspective on Terrorism and Counterterrorism (Education Abroad); The Evolution of Hezbollah; Terrorism and Small Wars; Political Islam in the West.
Repeatable to: 9 credits if content differs.

BSST340 Oral Communication for National Security Careers (3 Credits)
Students will discuss perspectives on strategic communication and national security, while discussing and practicing public speaking skills and developing proficiency in three genres of security-related briefings. Students will work with the technical, scientific, and/or specialized data, vocabularies, processes, and products of the academic disciplines and/or fields of expertise relevant to national and international security careers.
Credit Only Granted for: BSST340 or BSST338E.
Formerly: BSST338E.

BSST358 Special Topics in Study Abroad III (1-6 Credits)
Special topics course taken as part of an approved study abroad program.
Repeatable to: 15 credits if content differs.

BSST370 Financing Terror and Hate (3 Credits)
This course will discuss terrorist financial activities, initiatives focused on countering those financial activities, and sanctions policy. This course approaches these topics through various techniques including, structured analytic tools, such as weighted ranking methods, scenario trees, causal flow diagramming, hypothesis testing, utility analysis, as well as game theory and logic will be incorporated into the course to provide students a better framework to form analytic judgments. At the end of the course, students will have gained a solid foundational understanding of the financing and counter-financing of terrorists.
Credit Only Granted for: BSST370 or BSST338Z.
Formerly: BSST338Z.

BSST371 Far-Right Extremism: Violent Ideologies and Actions (3 Credits)
Introduces students to the ideologies, organizing patterns, and actions within far-right extremism. This will include a focus on movements within white supremacism, anti-government extremism, male supremacy, homophobia, and anti-immigrant extremism. Using as examples specific violent extremists and groups on the far-right, we will study key theories explaining extremist radicalization, recruitment, engagement, and mobilization.
Credit Only Granted for: BSST338R or BSST371.
Formerly: BSST338R.

BSST372 Terrorist Hostage Taking (3 Credits)
Examines different forms of hostage taking, drawing on theory and research from across a range of different fields, including international relations, political science, criminology, psychology, sociology and economics. We will consider these events in terms of how they are similar, how they differ and what they are designed to achieve. This course provides insights into the complicated nature of terrorism via hostage taking in order to broaden student understanding of current events. This course also gives students practical experience in finding and coding data, and studying complex human behaviors.

BSST373 Analyzing Terrorism: Simulations, Wargaming, and Strategies of Security (3 Credits)
Introduces students to novel, applied methods to study terrorism and security, including simulations, wargaming exercises, and red teaming. This course assumes no prior experience with these methods. Throughout the course, students will complete activities to understand the behavior of militant groups and develop security strategies to counter violent non-state actors.
Credit Only Granted for: BSST338J or BSST373.
Formerly: BSST338J.

BSST374 Political Assassinations (3 Credits)
Course topics include political assassinations, their consequences, and the possible means for their prevention, from profiling assassins to protection of potential targets. Research on political assassinations has developed from many different disciplines and so we will be drawing on theory and research from across a range of different fields, including international relations, political science, criminology, psychology, sociology and economics. In each lecture we will review the scholarly issues associated with political assassinations as well as considering the practical, counter attack challenges faced by security and law enforcement.

BSST375 Violent Non-State Actors in Latin America: Terrorism, Cartels, and Crime (3 Credits)
Examines why non-state actors resort to violence and crime, what tactics and strategies they use, how they fund their existence, and what can be done to counter them. Throughout the course, students will be introduced to many different types of violent non-state actors, including terrorist organizations and criminal organizations. This will all be done in the context of Latin America and students will gain an in-depth understanding of the problems that plague individual countries, as well as which issues afflict the region as a whole.
Credit Only Granted for: BSST338L or BSST375.
Formerly: BSST338L.

BSST376 Al-Qaeda, the Islamic State, and Global Jihadist Movements (3 Credits)
Provides an in-depth overview into global jihadist movements, with specific focus on the terrorist groups known as al-Qaeda and the Islamic State of Iraq and the Levant. In an effort for students to come to a common understanding of key terms that will be discussed throughout the course, a session will be devoted to understanding key concepts and terms related to Islamic history. The course will also examine the Islamic State's connection and ultimate divorce from al-Qaeda. The course will all examine group finances, as well as the rise of affiliates. The course will also explore the use of foreign fighters and social media, as well as global responses to these movements and groups.
Credit Only Granted for: BSST338V or BSST376.
Formerly: BSST338V.

BSST377 Applying Theory to the Practice of Countering Terrorism (1 Credit)
Focuses on current events related to terrorism and counterterrorism, as they are discussed in mass media, and the implications of those current events on the ethical and professional conduct of the counterterrorism community. Through a discussion-based seminar, students will bring current, terrorism-related events to classroom discussion, where they will consider the media-framed current events in relation to academic research. Students will be continually challenged to draw connections between terrorism-related events in the news and relevant academic research. Furthermore, this class will use vignettes based in current events to present students with real-world ethical dilemmas that those in the professional counterterrorism community and broader national security community have to confront.
Recommended: BSST330.
Restriction: Restricted to students enrolled in the Global Terrorism Studies Minor (#BS07) who have earned 90 credits.
Credit Only Granted for: BSST327, BSST377, or BSST399K.
Formerly: BSST327.
Additional Information: It is recommended that this course be taken in the final semester in the minor program.

BSST386 Experiential Learning in Terrorism Studies (1-5 Credits)
This course will supplement student's experiential learning experience, or internship in the field of terrorism studies and homeland security with guided reflection on their experiences.

BSST389 Internship in Terrorism Studies (1-6 Credits)
Supplements student's experiential learning experience, or internship in the field of terrorism studies and homeland security, with guided reflection on their experiences.
Repeatable to: 9 credits.

BSST398 Individual Study in Terrorism Studies II (1-3 Credits)
An independent study course for START Students.
Repeatable to: 9 credits if content differs.

BSST399 Individual Study in Terrorism Studies (1-3 Credits)
An independent study course for students in the Global Terrorism Minor program.
Repeatable to: 9 credits if content differs.

BSST458 Special Topics in Study Abroad IV (1-6 Credits)
Special topics course taken as part of an approved study abroad program.
Repeatable to: 15 credits if content differs.

CCJS - Criminology and Criminal Justice

CCJS100 Introduction to Criminal Justice (3 Credits)
Introduction to the administration of criminal justice in a democratic society, with emphasis on the theoretical and historical development of law enforcement. The principles of organization and administration for law enforcement; functions and specific activities; planning and research; public relations; personnel and training; inspection and control; direction; policy formulation.

CCJS105 Introduction to Criminology (3 Credits)
Criminal behavior and the methods of its study; causation; typologies of criminal acts and offenders; punishment, correction and incapacitation; prevention of crime.

CCJS158 Special Topics in Study Abroad I (1-6 Credits)
Special topics course taken as part of an approved study abroad program.
Repeatable to: 15 credits if content differs.

CCJS188 Topics in Criminology and Criminal Justice (3 Credits)
Contemporary and emerging crimes and the response to them by criminal justice agencies. Emphasis is on the emergence of new forms of crimes or criminals.
Prerequisite: CCJS100 or CCJS105.
Repeatable to: 6 credits if content differs.

CCJS200 Statistics for Criminology and Criminal Justice (3 Credits)
Introduction to descriptive and inferential statistics, graphical techniques, and the computer analysis of criminology and criminal justice data. Basic procedures of hypothesis testing, correlation and regression analysis, and the analysis of continuous and binary dependent variables. Emphasis upon the examination of research problems and issues in criminology and criminal justice.
Prerequisite: CCJS100 or CCJS105; and 1 course with a minimum grade of C- from (STAT100, MATH107, MATH111, MATH120, MATH130, MATH135, MATH140).
Restriction: Must be in Criminology and Criminal Justice program; or permission of BSOS-Criminology & Criminal Justice department.

CCJS225 Responses to Violence (3 Credits)
What are the dimensions of violence in the United States and worldwide, and how has humanity responded to violence? Conflict is unfortunately resolved through violence in a number of settings. It ranges from interpersonal to international in its scope. This course investigates the strengths and weaknesses of a number of resolutions to reducing violence over the course of history using both state centered and informal control.

CCJS230 Criminal Law in Action (3 Credits)
Law as one of the methods of social control. Criminal law: its nature, sources and types; theories and historical developments. Behavioral and legal aspects of criminal acts. Classification and analysis of selected criminal offenses.
Prerequisite: CCJS100.

CCJS234 Law of Criminal Investigation (3 Credits)
General principles and theories of criminal procedure. Due process. Arrest, search and seizure. Recent developments. Study and evaluation of evidence and proof.
Prerequisite: CCJS100 and CCJS230.

CCJS258 Special Topics in Study Abroad II (1-6 Credits)
Special topics course taken as part of an approved study abroad program.
Repeatable to: 15 credits if content differs.

CCJS278 Special Topics in Criminology and Criminal Justice (3 Credits)
Topics of special interest to undergraduates in criminology and criminal justice. Offered in response to student request and faculty interest. May be delivered online.
Repeatable to: 6 credits if content differs.

CCJS288 Special Topics in Law and Justice (3 Credits)
An analysis of recent developments in criminal law and their implications for criminal justice systems and research. Focus will be on Supreme Court decisions and legislative initiatives.
Prerequisite: CCJS105 and CCJS230.
Repeatable to: 6 credits if content differs.

CCJS300 Criminological and Criminal Justice Research Methods (3 Credits)
Introduction to the formulation of research questions covering crime and justice, research designs, data collection, and interpretation and reporting in criminological and justice-system settings.
Prerequisite: CCJS100 and CCJS105; and (PSYC200, CCJS200, ECON321, BMGT230, or SOCY201).

CCJS301 Fundamentals in Criminal Justice (3 Credits)
Provides an overview of the three major components of the American criminal justice system: police, courts, and corrections. Each component will be explored in its development over time as well as various issues surrounding each component. This course will also cover important issues that are relevant to current debates including race, reentry, technology and crime, juvenile justice, and future directions for criminal justice.
Restriction: Must be enrolled at The Universities at Shady Grove; and must be in the Criminal Justice minor; or by permission of department; and must not be in the Criminology and Criminal Justice major.

CCJS310 Criminal Investigations (3 Credits)
An introduction to modern methods used in detection, investigation, and solution of crime. Students will be taught basic and advanced investigative techniques utilized by law enforcement agencies. Analysis of actual cases will be used to demonstrate practical uses of these techniques.
Prerequisite: CCJS100 and CCJS230.

CCJS315 Ethics in Criminal Justice (3 Credits)
Introduces the study of ethics and ethical decision making as it is applied to the criminal justice system. Students will be introduced to consequential philosophers and their work, and will discuss those theories in terms of how decision making is applied in policing, courts, corrections, the juvenile system, victim services, and the medical system. There will be a special discussion of how ethical decision making intersects with racism, classism, and sexism in criminal justice. Students will be able to assess the intersections of race, gender, age, sexual orientation, ethnicity, and class and the way those identities impact ethical decision making of acts.
Prerequisite: CCJS100.
Credit Only Granted for: CCJS315 or CCJS498L.
Formerly: CCJS498L.

CCJS318 Special Topics in Criminology & Criminal Justice (3 Credits)
Special topics in various aspects of the field of criminology and criminal justice will be covered.
Repeatable to: 15 credits if content differs.

CCJS320 Introduction to Criminalistics (3 Credits)
An introduction to modern methods used in the detection, investigation and solution of crimes. Practical analysis of evidence in a crime laboratory, including fingerprints and other impressions, firearms ID and ballistics, hairs and fibers, document examination, and use of polygraph.
Prerequisite: CCJS100 and CCJS230.

CCJS321 Computer and Digital Forensics (3 Credits)
An introduction to the methods used in the seizure and forensic analysis of computers, cell phones, and other digital evidence. Students will be familiarized with the use of digital evidence in criminal investigations, relevant case law in computer crime and digital evidence, and the challenges faced by law enforcement. Students will be introduced to the computer forensic tools used by today's law enforcement agencies and basic computer/data storage concepts. This course will include some basic practical application of these tools and concepts in a computer lab environment.
Credit Only Granted for: CCJS498I or CCJS321.
Formerly: CCJS498I.

CCJS325 Slavery in the Twenty First Century: Combating Human Trafficking (3 Credits)
What is human trafficking and how do we stop it? An introduction to the trafficking of human beings in its historical, legal, economic, political and social contexts. Scope of the global problem, different forms of human trafficking, and regional trends and practices. Roles of government, the international community and individual actors. Strategies to combat trafficking.

CCJS330 Contemporary Criminological Issues (3 Credits)
Topics may include career criminals, prison overcrowding, prediction, ecological studies of crimes, family and delinquency, entrepreneurship in criminal justice and criminology, and similar criminological problems.
Prerequisite: CCJS100 and CCJS105.

CCJS331 Contemporary Legal Policy Issues (3 Credits)
In-depth examination of selected topics. Criminal responsibility. Socio-legal policy alternatives with regard to deviance. Law enforcement procedures for civil law and similar legal problems. Admissibility of evidence. Representation. Indigent's right to counsel.
Prerequisite: CCJS100 and CCJS230.

CCJS332 Major Transitions: From Undergraduate to Professional (1 Credit)
This course is designed to assist criminology and criminal justice students explore career opportunities. Topics will include: graduate school, law school, career opportunities in federal, state, local, and public agencies, resume writing, and internships.
Restriction: Must be in Criminology and Criminal Justice program; and sophomore standing or higher.

CCJS333 Navigating Your Future: Transforming Your Degree into your Career (3 Credits)
Assists Criminology and Criminal Justice students in exploring and preparing for entering graduate school and/or the professional work world. Academic success and professional development in the criminal justice field will be emphasized. Specific topics covered in the course include graduate school options, the benefits of a social science degree, and careers in private industry, nonprofit organizations, and federal, state, and local agencies. Will also focus on job preparation skills including writing a resume, creating a cover letter, and preparing for an interview.
Restriction: Must be in the Criminology and Criminal Justice major (22091 and 2209L); or must be in the and Criminal Justice minor (#BS14) with 30 or more credits.
Credit Only Granted for: CCJS333 or CCJS498Q.
Formerly: CCJS498Q.

CCJS340 Policing (3 Credits)
Critical issues relating to policing. Topics include police discretion, role of police, use of force, misconduct, police research, administration, personnel, and etc.
Prerequisite: CCJS100.

CCJS342 Corrections (3 Credits)
Examination of the American correctional system. Identification of historical and contemporary themes, issues, and trends. Evaluation of correctional policies, practices and research.
Prerequisite: CCJS100.
Restriction: Must be in a major within the BSOS-Criminology & Criminal Justice department.
Credit Only Granted for: CCJS342 or CCJS452.

CCJS345 Courts and Sentencing (3 Credits)
Contemporary issues in the American court system such as prosecution, sentencing and punishment. Theoretical perspectives on courtroom decision-making integrated with empirical research. Courts and sentencing processes, including initial charging, pretrial detention and final sentencing outcomes. Innovations in courts and sentencing.
Prerequisite: CCJS100.
Restriction: Must be in a major within the BSOS-Criminology & Criminal Justice department.

CCJS346 Domestic Violence (3 Credits)
A thorough and critical examination of family violence. Topics include the historical background to family violence, methods of studying this serious issue, elder abuse, child abuse, the cultural factors involved in intimate partner violence, violence in same-sex relationships, and the criminal justice response to family violence. Although the course focuses on the American family, illustrations from other cultures are provided.
Prerequisite: CCJS100.
Credit Only Granted for: CCJS346 or CCJS498Y.
Formerly: CCJS498Y.

CCJS352 Drugs and Crime (3 Credits)
An analysis of the role of criminal justice in the control of drug use and abuse.
Prerequisite: CCJS100.

CCJS358 Special Topics in Study Abroad III (1-6 Credits)
Special topics course taken as part of an approved study abroad program.
Repeatable to: 15 credits if content differs.

CCJS359 Field Training in Criminology and Corrections (1-6 Credits)
Supervised field training in public or private social agencies. Group meetings, individual conferences and written program reports.
Restriction: Permission of BSOS-Criminology & Criminal Justice department.
Repeatable to: 6 credits.

CCJS360 Victimology (3 Credits)
Overview of the history and theory of victimology. Analysis of victimization patterns with special emphasis on types of victims and crimes. The interaction between victims of crime and the criminal justice system with respect to the role of the victim and the services offered to the victim.
Prerequisite: CCJS105.

CCJS370 Race, Crime and Criminal Justice (3 Credits)
Role and treatment of racial/ethnic minorities in the criminal justice system. Course will provide students with historical and theoretical framework for understanding this dynamic.

CCJS386 Experiential Learning (3-6 Credits)
Restriction: Permission of BSOS-Criminology & Criminal Justice department; and junior standing or higher.

CCJS388 Independent Reading Course in Criminology and Criminal Justice (3 Credits)
Designed for the needs of honor students in criminology and criminal justice.
Prerequisite: CCJS100 and CCJS105.
Restriction: Must be in the Honors program.

CCJS389 Independent Research in Criminology and Criminal Justice (1-6 Credits)
Independent Research for CCJS Departmental Honors students.
Prerequisite: CCJS105.
Restriction: Must be in CCJS Honors Program.
Repeatable to: 6 credits if content differs.

CCJS398 Law Enforcement Field Training (1-6 Credits)
Supervised, structured and focused field training in law enforcement agencies.
Restriction: Permission of BSOS-Criminology & Criminal Justice department.
Repeatable to: 6 credits.

CCJS399 Independent Study in Criminology and Criminal Justice (1-3 Credits)
Integrated reading or research under direction and supervision of a faculty member.
Restriction: Permission of BSOS-Criminology & Criminal Justice department.
Repeatable to: 6 credits.

CCJS405 Gangs (3 Credits)
Provides students with a historical and contemporary examination of street and institutional gangs. We will address the nature and definition of gangs, types of gangs, and diversity of membership of gangs, theoretical explanations, and criminal and deviant behavior. In addition, we will analyze law enforcement responses, intervention and prevention strategies, and public policy issues.
Prerequisite: CCJS100 and CCJS105.
Credit Only Granted for: CCJS405 or CCJS498G.
Formerly: CCJS498G.

CCJS418 Seminar in Criminology and Criminal Justice (3 Credits)
Selected topics of interest in the field of Criminology and Criminal Justice will be covered.
Repeatable to: 18 credits if content differs.

CCJS428 Special Topics in Criminology and Criminal Justice (3 Credits)
Topics in various aspects of the field of criminology and criminal justice will be covered.
Repeatable to: 18 credits if content differs.

CCJS440 Security Administration (3 Credits)
Designed to introduce students to the complex issues of Security Administration and the critical terrorism issues facing the nation. Emphasis is placed on understanding the historical and contemporary issues effecting U.S. Counterterrorism Policy. It also explores the challenges facing today's security administrators including: ethics, classified information, intelligence, terrorist organizations and incidents, physical and personnel security, transportation and border security issues.
Prerequisite: CCJS100 and CCJS340.
Credit Only Granted for: CCJS440 or CCJS498Z.
Formerly: CCJS498Z.

CCJS444 Advanced Law Enforcement Administration (3 Credits)
The structuring of manpower, material, and systems to accomplish the major goals of social control. Personnel and systems management. Political controls and limitations on authority and jurisdiction.
Prerequisite: CCJS100 and CCJS340.

CCJS450 Advanced Juvenile Delinquency (3 Credits)
Examination of juvenile delinquency in the United States. Nature and extent of juvenile delinquency, historical approaches, sociological and criminological theories and research, social contexts including the institutions of families, schools, and peers, and social responses. Prevention, punishment, and treatment programs, both within and outside of the juvenile justice and criminal justice systems.
Prerequisite: CCJS105 and CCJS300.
Credit Only Granted for: CCJS350 or CCJS450.

CCJS451 Crime and Delinquency Prevention (3 Credits)
Methods and programs in prevention of crime and delinquency.
Prerequisite: CCJS105 and CCJS300.

CCJS453 White Collar and Organized Crime (3 Credits)
Definition, detection, prosecution, sentencing and impact of white collar and organized crime. Special consideration given to the role of federal law and enforcement practices.
Prerequisite: CCJS300; and (CCJS350 or CCJS105).

CCJS454 Contemporary Criminological Theory (3 Credits)
Examination of the main theoretical accounts that explain the underlying causes of criminal behaviors. Explore how individual choices, socialization experiences, biological factors and social structure affect criminal behaviors.
Prerequisite: CCJS300 and CCJS105.

CCJS458 Special Topics in Study Abroad IV (1-6 Credits)
Special topics course taken as part of an approved study abroad program.
Repeatable to: 15 credits if content differs.

CCJS460 Victim Advocacy (3 Credits)
Introduces the practice of victim advocacy as a profession. Students will develop an understanding of the impact of crime on the victim, and how crime impacts the path of the victim through the criminal justice and other administrative processes. A special emphasis of the course will be on introducing the students to different contexts of victim advocacy, e.g. system-based, campus-based, military-based, and community-based, as well as special topics impacting the profession of victim advocacy, e.g. grief, death notification, child protection, violence intervention, and trauma therapy. Students will also develop an understanding about how race, gender, age, sexual orientation, and ethnicity impact the way in which victims are offered and receive advocacy in different systems.
Prerequisite: CCJS100.
Recommended: CCJS360.
Credit Only Granted for: CCJS460 or CCJS498T.
Formerly: CCJS498T.

CCJS461 Psychology of Criminal Behavior (3 Credits)
Biological, environmental, and personality factors which influence criminal behaviors. Biophysiology and crime, stress and crime, maladjustment patterns, psychoses, personality disorders, aggression and violent crime, sex-motivated crime and sexual deviations, alcohol and drug abuse, and criminal behavior.
Prerequisite: CCJS105 and CCJS300.

CCJS489 Honors Thesis Research (3 Credits)
Designed for students completing their honors thesis.
Prerequisite: CCJS100 and CCJS105.
Restriction: Limited to CCJS Departmental Honors students.
Repeatable to: 6 credits.

CCJS498 Selected Topics in Criminology and Criminal Justice (3 Credits)
Topics of special interest to advanced undergraduates in criminology and criminal justice. Offered in response to student request and faculty interest.
Repeatable to: 6 credits if content differs.

CHBE - Chemical and Biomolecular Engineering

CHBE100 Exploring ChBE (1 Credit)
Overview of the specializations and career paths available in chemical and biomolecular engineering. Academic planning, policies and resources will be covered including introduction to undergraduate research, study abroad, internship and co-op opportunities as well as chemical engineering student groups. A peer mentoring program will enable students to interact with successful upper-class chemical engineering students and build their chemical engineering peer network.
Prerequisite: Permission of instructor; and permission of ENGR-Chemical & Biomolecular Engineering department.
Restriction: Must be in a major within the ENGR-Chemical & Biomolecular Engineering department.

CHBE101 Introduction to Chemical and Biomolecular Engineering (3 Credits)
Introduction to methods of chemical engineering calculations and analysis. Stoichiometric relations, material and energy balances, and behavior of gases, vapors, liquids and solids. Analytical and computer methods.
Prerequisite: CHEM135; or students who have taken courses with comparable content may contact the department.
Corequisite: MATH141.
Restriction: Must be in Engineering: Chemical program; or permission of ENGR-Chemical & Biomolecular Engineering department.
Credit Only Granted for: CHBE101 or ENCH215.
Formerly: ENCH215.

CHBE102 Coffee BEANS: Brewing Engineering and Analysis for Nurturing Sustainability (3 Credits)
In this interdisciplinary course, students will explore the intricate journey of making one of the world's most-consumed beverage through the combined lens of sustainability and engineering. We will address the critical question: How sustainable is a daily cup of coffee? The course will begin with an overview of coffee production, from cultivation to consumption, examining energy targets, water usage, waste practices, and the environmental impact of coffee farming. Instruction in lectures will provide background on engineering concepts and types of sustainable practices. Students will engage in experiments, focusing on extraction techniques, to visualize scientific principles. The course will also align discussions with the United Nations Sustainable Development Goals, emphasizing the global implications of coffee production and consumption.

CHBE250 Computer Methods in Chemical Engineering (3 Credits)
Algorithm development and application of software to the analysis of chemical engineering problems. File management and editing, graphics and numerical methods. Use of spreadsheets, statistics/math software and process simulators for the design of chemical process equipment.
Prerequisite: CHBE101; and must have completed or be concurrently enrolled in MATH241.
Restriction: Must be in a major within the ENGR-Chemical & Biomolecular Engineering department.
Credit Only Granted for: CHBE250 or ENCH250.
Formerly: ENCH250.

CHBE301 Chemical and Biomolecular Engineering Thermodynamics I (3 Credits)
Principles of thermodynamics and their application to engineering problems. First and second laws of thermodynamics, properties of gases, liquids and solids, phase equilibrium, flow and non-flow systems, energy conversion, production of work from heat, thermodynamic analysis of processes, equilibrium stage operations and the thermodynamics of chemically reacting systems.
Prerequisite: CHBE101; and must have completed or be concurrently enrolled in CHBE250 and MATH241.
Restriction: Must be in Engineering: Chemical program; and permission of ENGR-Chemical & Biomolecular Engineering department.
Credit Only Granted for: ENCH300 or CHBE301.
Formerly: ENCH300.

CHBE302 Chemical and Biomolecular Engineering Thermodynamics II (3 Credits)
Contemporary trends in chemical engineering thermodynamics that bridge the gap between fundamentals and applications. Thermodynamic analysis of non-ideal and structured systems; such as complex fluids, strongly fluctuating and nanoscale systems, dissipative systems, biosystems, and systems under extreme conditions.
Prerequisite: CHBE301.
Corequisite: CHBE250.
Restriction: Must be in a major within ENGR-Chemical & Biomolecular Engineering department.
Credit Only Granted for: CHBE302 or ENCH400.
Formerly: ENCH400.

CHBE333 Chemical Engineering Seminar (1 Credit)
To develop oral communication skills through a series of class presentations of current chemical engineering topics.
Restriction: Junior standing; and must be in a major within ENGR-Chemical & Biomolecular Engineering department; and permission of ENGR-Chemical & Biomolecular Engineering department.
Credit Only Granted for: CHBE333 or ENCH333.
Formerly: ENCH333.

CHBE369 Teaching Experiences in Chemical Engineering (1-2 Credits)
Students will obtain pedagogical experience by assisting with the teaching of undergraduate courses in Chemical and Biomolecular Engineering.
Restriction: Must be in a major within the ENGR-Chemical & Biomolecular Engineering department; and permission of ENGR-Chemical & Biomolecular Engineering department.
Repeatable to: 8 credits.

CHBE409 Undergraduate Honors Seminar (1 Credit)
Students will attend and write summaries of departmental seminars, along with professional development activities
Restriction: Must be in a major within the ENGR-Chemical & Biomolecular Engineering department; and Permission of ENGR-Chemical & Biomolecular Engineering department; and Must be in the Chemical Engineering Honors Program.
Repeatable to: 2 credits.

CHBE410 Statistics and Design of Experiments (3 Credits)
An introduction to probability, statistics, and design of experiments for chemical engineers.
Prerequisite: Minimum grade of C- in CHBE250, MATH241, and MATH246.
Restriction: Must be in a major within the ENGR-Chemical & Biomolecular Engineering department; and permission of ENGR-Chemical & Biomolecular Engineering department.
Credit Only Granted for: CHBE410 or ENCH476.
Formerly: ENCH476.

CHBE422 Chemical and Biomolecular Engineering Transport Phenomena I (3 Credits)
Principals of fluid dynamics as applied to model development and process design. Mass, momentum and energy conservation. Statics and surface tension. Equation of Continuity and Navier-Stokes Equation with application to laminar flow. Dimensional analysis. Macroscopic balances, Bernoulli Equation and friction factors with application to turbulent flow.
Prerequisite: Minimum grade of C- in CHBE101, CHBE250, MATH241, and MATH246.
Restriction: Must be in a major within the ENGR-Chemical & Biomolecular Engineering department; and permission of ENGR-Chemical & Biomolecular Engineering department.
Credit Only Granted for: CHBE422 or ENCH422.
Formerly: ENCH422.

CHBE424 Chemical and Biomolecular Engineering Transport Phenomena II (3 Credits)
Principles of mass and heat transfer as applied to model development and process design. Species continuity equation with application to diffusion, and convection in laminar flow. Macroscopic balances and mass transfer coefficients with application to turbulent flow. Microscopic equation of energy with application to heat conduction, and convection in laminar flow. Macroscopic energy balance and heat transfer coefficients with application to turbulent flow. Heat exchanger design.
Prerequisite: CHBE422.
Corequisite: CHBE302.
Restriction: Must be in Engineering: Chemical program; and permission of ENGR-Chemical & Biomolecular Engineering department.
Credit Only Granted for: CHBE424 or ENCH424.
Formerly: ENCH424.

CHBE426 Chemical and Biomolecular Separation Processes (3 Credits)
Separation by stages operations. Rate dependent separation processes. Design application in distillation, gas absorption, liquid extraction, drying, adsorption and ion exhange.
Corequisite: CHBE302; and CHBE424.
Restriction: Must be in Engineering: Chemical program; and permission of ENGR-Chemical & Biomolecular Engineering department.
Credit Only Granted for: CHBE426 or ENCH426.
Formerly: ENCH426.

CHBE437 Chemical and Biomolecular Engineering Laboratory (3 Credits)
Application of chemical engineering process and unit operation principals in small-scale semi-commercial equipment. Data from experimental observations are used to evaluate performance and efficiency of operations. Emphasis on correct presentation of results inreport form.
Prerequisite: CHBE424, CHBE426, and CHBE440.
Restriction: Must be in a major within ENGR-Chemical & Biomolecular Engineering department; and permission of ENGR-Chemical & Biomolecular Engineering department.
Credit Only Granted for: CHBE437 or ENCH437.
Formerly: ENCH437.

CHBE440 Chemical Kinetics and Reactor Design (3 Credits)
Fundamentals of chemical reaction kinetics and their application to the design and operation of chemical reactors. Reaction rate theory, homogeneous reactions and catalysis electrochemical reactions. Catalytic reactor design.
Prerequisite: Minimum grade of C- in CHBE301, MATH241, and MATH246.
Restriction: Must be in Engineering: Chemical program; and permission of ENGR-Chemical & Biomolecular Engineering department.
Credit Only Granted for: CHBE440 or ENCH440.
Formerly: ENCH440.

CHBE442 Chemical and Biomolecular Systems Analysis (3 Credits)
Dynamic response applied to process systems. Goals and modes of control, Laplace transformations, analysis and synthesis of simple control systems, closed loop response, dynamic testing.
Prerequisite: CHBE424 and CHBE426.
Credit Only Granted for: CHBE442 or ENCH442.
Formerly: ENCH442.

CHBE444 Process Engineering Economics and Design I (3 Credits)
Principles of chemical engineering economics and process design. Equipment sizing and costing. Economic evaluation of projects. Flowsheet synthesis. Introduction to flowsheet simulators and concepts of flowsheet optimization. Synthesis of Heat Exchanger Networks and Distillation Sequences.
Prerequisite: CHBE424, CHBE426, and CHBE440.
Restriction: Must be in a major within the ENGR-Chemical & Biomolecular Engineering department; and permission of ENGR-Chemical & Biomolecular Engineering department.
Credit Only Granted for: CHBE444 or ENCH444.
Formerly: ENCH444.

CHBE446 Process Engineering Economics and Design II (3 Credits)
Application of chemical engineering principles for the design of chemical processing equipment. Representative problems in the design of chemical plants will be the focus of this capstone design class. Comprehensive reports are required.
Prerequisite: CHBE442 and CHBE444.
Restriction: Must be in a major within the ENGR-Chemical & Biomolecular Engineering department; and permission of ENGR-Chemical & Biomolecular Engineering department.
Credit Only Granted for: CHBE446 or ENCH446.
Formerly: ENCH446.

CHBE451 Photovoltaics: Solar Energy (3 Credits)
The emphasis of the class is on developing a conceptual understanding of the device physics and manufacturing processes of crystalline and thin-film photovoltaic cells, and to develop elementary computational skills necessary to quantify solar cell efficiency. The class material includes detailed, system-level energy balances necessary to understand how solar energy fits into the complete energy generation, conversion, and storage picture. Quantitative comparisons of PV technology to solar chemical conversion processes and biofuels are made.
Jointly offered with: CHBE651.
Restriction: Permission of ENGR-Chemical & Biomolecular Engineering department.
Credit Only Granted for: ENCH468L, CHBE451 or CHBE651.
Formerly: ENCH468L.

CHBE452 Introduction of Machine Learning in Chemical Engineering (3 Credits)
Introduction of data science and machine learning approaches to modern problems in chemical engineering and materials science. This course develops data science approaches, including their foundational mathematical and statistical basis, and applies these methods to data sets of limited size and precision. Methods for regression and clustering will be developed and applied, with an emphasis on validation and error quantification. Techniques that will be developed include linear and nonlinear regression, clustering and logistic regression, dimensionality reduction, unsupervised learning, and artificial neural networks. These methods will be applied to a range of engineering problems, including conducting polymers, stretchable conductors, organic synthesis, and quality control in manufacturing.
Recommended: Basic knowledge of chemical engineering, materials science, ordinary differential equations, and Python is desirable.
Jointly offered with: CHBE652.
Restriction: Permission of Department or Instructor.
Credit Only Granted for: CHBE452 or CHBE652.

CHBE454 Chemical Process Analysis and Optimization (3 Credits)
Application of mathematical models to the analysis and optimization of chemical processes. Models based on transport, chemical kinetics and other chemical engineering principles will be employed.
Credit Only Granted for: CHBE454 or ENCH454.
Formerly: ENCH454.

CHBE455 Model Predictive Control (3 Credits)
Empirical model identification from process data. Step and impulse response models. Linearization of nonlinear first principles models. Single variable Model Predictive Control. Robustness with respect to modeling error. MPC based tuning of PID controllers. Feedforward control. Multi-input multi-output processes. Multi-loop decentralized control. Centralized multivariable Model Predictive Control via on-line optimization.
Credit Only Granted for: CHBE455 or ENCH455.
Formerly: ENCH455.

CHBE457 Design and Processing of Polymers for Biomedical Devices (3 Credits)
Provides a foundation for understanding the use of various materials in medical applications. We will discuss design principles, based on biological context for drug delivery, diagnosis of disease, imaging applications, tissue engineering, among other relevant topics. The course will cover nanomedicine approaches (lipids, polymers, gold nanoparticles, carbon nanotubes, etc.), as well as scaffolds for tissue engineering and regenerative medicine. We will discuss advantages, challenges, and recent advances in the field. The course will highlight the importance of rational engineering when designing products to be used to treat and diagnose disease.
Prerequisite: MATH246; and CHEM231; and (CHBE301, ENMA461, or BIOE232).
Recommended: Knowledge of basic fluid dynamics: CHBE422/BIOE331 or equivalent.
Restriction: Permission of ENGR-Chemical & Biomolecular Engineering department.
Credit Only Granted for: BIOE453, CHBE457, or ENMA425.

CHBE468 Research (1-3 Credits)
Investigation of a research project under the direction of a faculty member. Comprehensive reports are required.
Restriction: Permission of Chemical and Biomolecular Engineering Department; and must be third or fourth year student; and must have minimum GPA of 3.0; and must have successfully completed all lower level engineering, science and mathematics courses for the major.
Repeatable to: 6 credits.
Formerly: ENCH468.

CHBE469 Special Projects (1-3 Credits)
Special project under the direction of a faculty member. Comprehensive reports are required.
Restriction: Permission of Chemical and Biomolecular Engineering Department; and must be third or fourth year student; and must have minimum GPA of 3.0; and must have successfully completed all lower level engineering, science and mathematics courses for the major.
Repeatable to: 6 credits if content differs.

CHBE470 Colloid and Interface Science (3 Credits)
Introduction to colloidal systems and interfacial science. Topics include preparation, stability and coagulation kinetics of colloidal suspensions. Introduction to DLVO theory, electrokinetic phenomena, colloidal aggregation, interfacial phenomena, double layer theory, surface chemistry. Discussion of interfacial thermodynamics and interfacial forces for solid-liquid interfaces. Applications to nanomaterial synthesis, nanomaterial and polymer self-assembly, protein-protein interactions, and protein aggregation will be discussed.
Prerequisite: CHBE424 and CHBE426.
Jointly offered with: CHBE670.
Restriction: Must be in a major within the ENGR-Chemical & Biomolecular Engineering department; and permission of ENGR-Chemical & Biomolecular Engineering department.
Credit Only Granted for: ENCH648F, CHBE470 or CHBE670.

CHBE471 Particle Science and Technology (3 Credits)
Particles are everywhere. We breathe them, eat them, and use them to make many non-particulate materials. Knowledge of particle science and technology is important for manufacturing, for occupational health and safety, as well as environmental considerations. In this multidisciplinary course, the focus will be on the study of science and technology relevant to multiphase systems consisting of solid and/or liquid particles surrounded by a gas. These topics fall loosely under the headings of powder and aerosol technology. Team design projects will be an integral component.
Prerequisite: Knowledge of undergraduate engineering thermodynamics, and transport phenomena; knowledge of numerical methods for solving systems of ordinary differential equations.
Restriction: Must be in a major within ENGR-Chemical & Biomolecular Engineering department; or permission of ENGR-Chemical & Biomolecular Engineering department.
Credit Only Granted for: CHBE471 or ENCH471.
Formerly: ENCH471.

CHBE472 Control of Air Pollution Sources (3 Credits)
Sources and effects of air pollutants, regulatory trends, atmospheric dispersion models, fundamentals of two-phase flow as applied to air pollution and air pollution control systems, design of systems for control of gases and particulate matter.
Jointly offered with: CHBE672.
Restriction: Permission of ENGR-Chemical & Biomolecular Engineering department.
Credit Only Granted for: CHBE472, CHBE672 or ENCH672.

CHBE473 Advanced Batteries and Fuel Cells (3 Credits)
The lecture will start from the basic electrochemical thermodynamics and kinetics, with emphasis on electrochemical techniques, fundamental principle and performance of batteries, and supercapacitors.
Jointly offered with: CHBE673.
Restriction: Permission of ENGR-Chemical & Biomolecular Engineering department.
Credit Only Granted for: CHBE473 or CHBE673.

CHBE474 Biopharmaceutical Process Development and Manufacturing (3 Credits)
Covers the fundamental steps involved in process development and manufacturing of biopharmaceuticals. An overview of different classes of biopharmaceuticals as well as manufacturing requirements for clinical development and regulatory approval will be provided. In depth coverage of manufacturing steps including cell culture, purification and formulation as well as drug product manufacturing, analysis and stability will be covered. Scientific literature will be used to highlight current challenges and novel solutions in each step of the manufacturing process. Scale up considerations, GMP requirements and process economics will also be introduced.
Prerequisite: BIOE120; and permission of instructor.
Jointly offered with: CHBE674.
Restriction: Permission of ENGR-Chemical & Biomolecular Engineering department.
Credit Only Granted for: CHBE474, BIOE489T, ENCH648D or CHBE674.

CHBE475 Ethics in Science and Engineering (3 Credits)
Ethical issues in science and engineering and their resolutions are examined. The main topics will be ethics and scientific truth (including issues of proper data analysis, proper data presentation, and record-keeping), ethics and other scientists and engineers (including issues of attribution, confidentiality, conflicts of interest, mentoring, and inclusion of under-represented groups), ethics and the practice of engineering (including responsibilities of engineers to clients, ecological issues, and conflicts of interest), and ethics and society (including funding priorities, moral issues, and human and animal subjects). Class meetings will be organized around discussions, case studies, and student reports. The course is aimed at postdoctoral students, graduate students and advanced undergraduate students who wish to ponder the important contemporary questions about the ethics of how science and engineering get done.
Credit Only Granted for: CHBE475 or ENCH475.
Formerly: ENCH475.

CHBE476 Molecular Modeling Methods (3 Credits)
Statistical mechanics will be introduced to give the fundamental background for atomic to mesoscale molecular modeling. Classical atomic-level simulations methods (Monte Carlo and Molecular Dynamics) and the procedures to develop intra- and intermolecular potentials will be covered. This course will also discuss the theory and application of coarse-grained molecular simulations, mesoscale simulations and other modern simulation techniques. A broad range of applications will be included throughout the semester, e.g., phase behavior of small molecules, kinetics, and biophysics.
Jointly offered with: CHBE476.
Restriction: Permission of ENGR-Chemical & Biomolecular Engineering department.
Credit Only Granted for: ENCH648P, CHBE476 or CHBE676.
Formerly: ENCH468P.

CHBE477 Mesoscopic and Nanoscale Thermodynamics (3 Credits)
Interdisciplinary course primarily for graduate and senior undergraduate students from engineering or science departments. New emerging technologies deal with bio-membrane and gene engineering, microreactor chemistry and microcapsule drug delivery, micro-fluids and porous media, nanoparticles and nanostructures, supercritical fluid extraction and artifical organs. Engineers often design processes where classical thermodynamics may be insufficient, e.g., strongly fluctuating and nanoscale systems, or dissipative systems under conditions far away from equilibrium.
Prerequisite: A prior course in classical thermodynamics.
Jointly offered with: CHBE477.
Restriction: Must be in a major within the ENGR-Chemical & Biomolecular Engineering department; and permission of ENGR-Chemical & Biomolecular Engineering department.
Credit Only Granted for: CHBE477, ENCH468Q or CHBE677.
Formerly: ENCH468Q.

CHBE480 Bionanotechnology: Physical Principles (3 Credits)
Physics at nano/micro scales. Biomolecular building blocks. Simplest biomolecular assembly: protein folding. Nanoscale intermolecular interactions important for biology. Protein-ligand binding. Protein higher-order assembly: filaments, networks. Protein filaments and motility. DNA, RNA and their assembly assisted by proteins. Viral capsid assembly. Lipid assembly into micelles, bilayers. Lipid-protein co-assembly in membranes. Lipid and polymer structures useful in medicine. Targeted delivery of drugs, genes by nano/micro structures. Cellular assembly in the eye, in insect wings. Cellular assembly at surfaces: gecko feet, duck feathers. Cellular assembly in the presence of crystals: biomineralization.
Prerequisite: BIOE120; or students who have taken courses with comparable content may contact the department.
Jointly offered with: CHBE680.
Restriction: Permission of ENGR-Chemical & Biomolecular Engineering department.
Credit Only Granted for: ENCH648N, CHBE480 or CHBE680.

CHBE481 Transport Phenomena in Small and Biological Systems (3 Credits)
Interdisciplinary course primarily for senior undergraduate and graduate students from engineering or science departments. The course's main goal is to make the students familiar with the fundamental physics and modeling of transport phenomena in small and biological systems, and their current scientific and engineering utilization in microfluidics, nanofluidics and biological systems.
Jointly offered with: CHBE681.
Restriction: Permission of ENGR-Chemical & Biomolecular Engineering department.
Credit Only Granted for: ENCH468W, CHBE481 or CHBE681.
Formerly: ENCH468W.
Additional Information: Adding graduate course to jointly offered and credit only granted for fields.

CHBE483 Bioseparations (3 Credits)
Engineering fundamentals of separations and purification of biological molecules. Case studies and examples illustrate principles and practice of centrifugation, precipitation, crystallization, filtration, membrane separations, chromatography, and affinity separation of recombinant proteins and other biomolecules. Process scale-up and economics of biotechnology products and processes.
Restriction: Permission of ENGR-Chemical & Biomolecular Engineering department.
Credit Only Granted for: ENCH483 or CHBE483.
Formerly: ENCH483.

CHBE484 Metabolic Pathway Engineering (3 Credits)
The state-of-the-art in metabolic engineering, with a focus on the analysis and engineering of metabolic pathways through (chemical) engineering principles, will be covered. Topics covered include: (1) overview of biochemistry and metabolism; (2) metabolic flux analysis and isotope labeling illustrated with examples from the recent scientific literature; (3) technologies for engineering metabolic pathways; (4) metabolic control analysis and pathway regulation; (5) applications of metabolic engineering to synthesis of biofuels and therapeutics; (6) specialized and related subjects such as protein engineering and synthetic biology.
Prerequisite: CHBE101 and CHBE440.
Jointly offered with: CHBE684.
Restriction: Permission of ENGR-Chemical & Biomolecular Engineering department.
Credit Only Granted for: ENCH468M, CHBE484 or CHBE684.
Formerly: ENCH468M.

CHBE485 Biochemical Engineering Laboratory (3 Credits)
Techniques of measuring pertinent parameters in fermentation reactors, quantification of production variables for primary and secondary metabolites such as enzymes and antibiotics, the insolubilization of enzymes for reactors, and the demonstration of separation techniques such as ultrafiltration and affinity chromatography.
Credit Only Granted for: CHBE485 or ENCH485.
Formerly: ENCH485.

CHBE486 Heterogeneous Catalysis for Energy Applications (3 Credits)
Introduction to heterogeneous catalytic science and technology for energy conversion and hydocarbon processing. Preparation and mechanistic characterization of catalyst systems, kinetics of catalyzed reactions, adsorption and diffusion influences in heterogenious reactions. An overview of heterogeneous catalysis in various energy-related applications, including petroleum refining, chemicals from biomass, valorization of shale gas, and CO2 utilization will be introduced.
Prerequisite: Minimum grade of C- in CHBE302, CHBE424, and CHBE440; and permission of instructor.
Restriction: Must be in a major within the ENGR-Chemical & Biomolecular Engineering department.
Credit Only Granted for: CHBE486, CHBE686 or ENCH686.

CHBE490 Polymer Science (3 Credits)
The elements of the polymer chemistry and industrial polymerization, polymer structures and physics, thermodynamics of polymer solutions, polymer processing methods, and engineering applications of polymers.
Credit Only Granted for: CHBE490, ENCH490, or ENMA495.
Formerly: ENCH490.

CHBE491 Electrochemical Energy Engineering (3 Credits)
Introduces students to the fundamentals of electrochemical engineering, covering thermodynamics, kinetics, and transport in electrochemical cells, as well as electrode structures and electroanalytical techniques. The course will next transition to focus on electrochemical devices, including batteries, fuel cells, and other devices as guided by student input. This course will serve as a foundation for students who are interested in becoming practicing electrochemical engineers, those who would like to pursue research careers, and those who wish to become familiar with a specialized area within engineering that will have a crucial and growing importance during their careers.
Prerequisite: CHBE302, CHBE440, and CHBE422.
Jointly offered with: CHBE691.
Restriction: Permission of ENGR - Chemical & Biomolecular Engineering Department.
Credit Only Granted for: CHBE691 or CHBE491.

CHBE493 Chemical Processes in Beer Brewing (3 Credits)
Covers chemical engineering principles and chemical processes involved in the brewing and quality control of beer. Topics will include extraction and isomerization of bittering compounds from hops, enzymatic reactions involved in mashing beer, colloidal chemistry of haze formation, and microbiology of yeast and fermentation. Quantitative models will be applied to these processes based on fundamental chemical engineering principles from reaction kinetics, thermodynamics, transport phenomena, and colloid and interfacial science.
Prerequisite: Minimum grade of C- in CHBE424 and CHBE440; and permission of instructor.
Restriction: Must be in a major within the ENGR-Chemical & Biomolecular Engineering department; and permission of ENGR- & Biomolecular Engineering department.
Credit Only Granted for: CHBE493 or CHBE693.
Additional Information: Neither the students nor the instructor will be making or working with alcoholic beverages in the course.

CHBE494 Sustainable Separations and Carbon Capture (3 Credits)
Provides a comprehensive overview of sustainable separations and carbon dioxide capture using synthetic membranes and sorbents.
Prerequisite: Minimum grade of C- in CHBE424, CHBE426 and CHBE440; and permission of instructor.
Restriction: Must be in a major within the ENGR-Chemical & Biomolecular Engineering department; and must have permission of ENGR- & Biomolecular Engineering department.
Credit Only Granted for: CHBE494 or CHBE694.

CHBE496 Polymeric Materials: Structure, Property, and Processing (3 Credits)
An intermediate level treatment of structures of polymers. An introduction to mechanical properties and processing of polymeric materials. Emphasis will be on how to establish the structure-property relationship and on how to achieve such understanding via different characterization methods.
Prerequisite: ENMA300; and permission of ENGR-Materials Science & Engineering department.
Cross-listed with: ENMA496.
Credit Only Granted for: ENMA496 or CHBE496.

CHBE497 Protein Engineering (3 Credits)
This course will cover the fundamentals of protein engineering and its applications in medicine, chemical processes, and energy. Topics will include the structure and function of biological molecules, rational design and directed evolution, construction of protein and peptide libraries, protein screening platforms, methods for characterizing structure and function of biological molecules. Scientific literature will be used to highlight key discoveries and current work in protein engineering.
Prerequisite: BIOE120, CHBE302, and CHBE440; and permission of instructor.
Jointly offered with: CHBE697.
Credit Only Granted for: CHBE497, BIOE489R, ENCH 648P or CHBE697.

CHSE - Counseling, Higher Education, and Special Education

CHSE200 College Success and Life Planning - Managing College and Career Life through Goal Development and Planning (3 Credits)
The overarching goal of this course is to guide new students affiliated with the TerpsEXCEED program in navigating the initial stages of college, career and campus life management. The course is organized around Academic and Career Habits, Cultural Know-How, Balance of Multiple Roles, and Self-Direction in order to address (a) skills and interest assessments, (b) goal setting, (c) organizational and independent living skills development, (d) travel and transportation orientation to navigate and access campus and College Park, (e) financial planning, (f) safety, (g) social activity access, and (h) basic scheduling and time management. TerpsEXCEED students will be matched with typical student peer supports for a more normalized college experience.
Restriction: Must be in the TerpsEXCEED Program; and permission from TerpsEXCEED Director.
Additional Information: Priority enrollment for students in the TerpsEXCEED program.

CHSE205 Disability: From Stigma and Sideshow to Mainstream and Main Street (3 Credits)
Explores the cultural, historical, educational, and medical roots of difference among human beings and examines the impact of cultural and technological changes on individuals traditionally identified as disabled. The course is designed to develop a broad understanding of the concept of "disability" and the emerging technologies that shape contemporary understanding of this phenomenon and the lives of those considered disabled.
Credit Only Granted for: EDSP289I or CHSE205.
Formerly: EDSP289I.

CHSE228 Common Ground Deliberative Dialogues (1 Credit)
Students will explore current societal issues through an intergroup, deliberative dialogue model. The course includes foundations of dialogue, identity reflection, peer leadership, engagement across differences, and dialogic skill-building.
Repeatable to: 2 credits if content differs.
Credit Only Granted for: CHSE228 or CHSE328.
Formerly: CHSE328.

CHSE230 Career Exploration and Development (3 Credits)
This course prepares TerpsEXCEED students for on-the-job internship experiences in future semesters by guiding them through career exploration, discovery, and skill development. Students will complete career assessments, develop resumes, practice interviews, engage employers, learn how to fill out applications, practice technical and soft skills to improve employability, and secure internship options for the next semester.
Restriction: Must be in the TerpsEXCEED program; and permission from the College of Education Student Services office.

CHSE376 Fundamentals of Sign Language (3 Credits)
Receptive and expressive skills in American Sign Language. Examination of the causes of deafness, characteristics of deaf education, and aspects of the culture of the deaf community.
Credit Only Granted for: EDSP376 or CHSE376.
Formerly: EDSP376.

CHSE377 Communicating with Sign Language Lab (1 Credit)
Interactive and supportive learning environment to refine ASL skills, receive feedback from instructors and peers, and deepen understanding of ASL linguistics and culture through experiential learning.
Corequisite: CHSE376 .

CHSE389 Independent Study (3 Credits)
Customized project based on an individual topic area within Counseling, Higher Education and Special Education
Recommended: Has completed at least one full semester; CHSE200.
Restriction: Permission from the Counseling, Higher Education, and Special Education Department.
Repeatable to: 9 credits.
Formerly: CHSE398.

CHSE476 Communicating with Sign Language (3 Credits)
Intermediate level receptive/expressive skills in American Sign Language. Aspects of the culture, history, and research perspectives of the deaf community.
Prerequisite: EDSP376 or CHSE376.
Restriction: Permission of EDUC-Counseling, Higher Education and Special Education department.
Credit Only Granted for: EDSP476 or CHSE476.
Formerly: EDSP476.

CHSE477 ASL III: Intermediate Sign Language Communication (3 Credits)
Designed for students to practice American Sign Language (ASL) at an intermediate level. Participants will delve deeply into expressive and receptive ASL conversation skills with attention to the function of classifiers.
Prerequisite: CHSE376 or EDSP376; and a minimum grade of B- in CHSE476 or EDSP476.
Recommended: CHSE377.

CHSE480 Deaf Culture, History, and Community (3 Credits)
Provides an in-depth exploration of Deaf Culture, emphasizing the traditions, values, and contributions of the Deaf community. Students will examine critical aspects of Deaf identities within Deaf world and mainstream society.
Prerequisite: CHSE376 or EDSP376; and CHSE476 or EDSP476; and a minimum grade of B- in CHSE477.
Recommended: EDSP377.

CHSE489 Internship - Terps Exceed (3 Credits)
Builds on students' individual career exploration process, which determines what types of internships students participate in. It is a fully experiential course that requires on-the-job experiences related to career interests and course of study; an additional semester can involve expansion of a position with new learning tasks or a new position. Students are graded on self-reflections, employer feedback, instructor observations and a final project demonstrating newly gained on-the-job knowledge and an updated career plan.
Recommended: CHSE230, CHSE388; or other career development course .
Restriction: Permission of Counseling, Higher Education, and Special Education Department.
Repeatable to: 6 credits.

CHSE498 Independent Study (1-3 Credits)
In collaboration with the approved instructor, students will define the scope of a service or research-based project, create a plan and timeline (with goals and projected outcomes), and present a product that demonstrates outcomes. This could include doing a service project with a Center or course within CHSE or specific program that aligns with a career interest or passion.
Recommended: Junior standing or higher.
Restriction: Permission of the department and instructor.
Repeatable to: 6 credits.

CHEM - Chemistry

CHEM131 Chemistry I - Fundamentals of General Chemistry (3 Credits)
An overview of the Periodic Table, inorganic substances, ionic and covalent bonding, bulk properties of materials, chemical equilibrium, and quantitative chemistry. CHEM131 is the first course in a four-semester sequence for students majoring in the sciences, other than Chemistry and Biochemistry majors.
Prerequisite: Must have math eligibility of MATH120 or higher.
Corequisite: CHEM132.
Recommended: For Science majors.
Credit Only Granted for: CHEM103, CHEM131, CHEM135, CHEM153 or CHEM146.
Formerly: CHEM103.

CHEM132 General Chemistry I Laboratory (1 Credit)
Introduction to the quantification of chemical substances, including the concept of the mole and chemical stoichiometry. Additional work involves the synthesis of ionic substances and their qualitative characterization. Must be taken concurrently with CHEM131.
Prerequisite: Must have math eligibility of MATH120 or higher.
Corequisite: CHEM131.
Credit Only Granted for: CHEM103, CHEM132, CHEM136, CHEM143, CHEM147 or CHEM177.
Formerly: CHEM103.

CHEM134 Chemical Principles for Engineering (1 Credit)
Basic chemistry for engineering students. Introduction to organic structures and polymers, gas laws, liquids, solids, phase changes, chemical kinetics and electrochemistry.
Prerequisite: Minimum grade of C- in CHEM131; or minimum grade of C- in CHEM146.
Credit Only Granted for: CHEM 134 or CHEM 135.

CHEM135 General Chemistry for Engineers (3 Credits)
The nature and composition of matter, solutions, chemical reactions, equilibria, and electrochemistry, with applications to various fields of engineering.
Prerequisite: Must have math eligibility of MATH120 or higher.
Credit Only Granted for: CHEM103, CHEM113, CHEM131, CHEM135, or CHEM146.

CHEM136 General Chemistry Laboratory for Engineers (1 Credit)
A laboratory course for engineering majors intending to take CHEM231 and CHEM232.
Prerequisite: Must have completed or be concurrently enrolled in CHEM135 and must have math eligibility of MATH120 or higher.
Restriction: Must be in a major in ENGR-A. James Clark School of Engineering.

CHEM146 Principles of General Chemistry (3 Credits)
An overview of the Periodic Table, inorganic substances, ionic and covalent bonding, bulk properties of materials, chemical equilibrium, and quantitative chemistry. CHEM146 is the first course in a four-semester sequence for Chemistry and Biochemistry majors.
Prerequisite: Must have math eligibility of MATH140 or higher.
Corequisite: CHEM177.
Restriction: Must be in one of the following programs (Chemistry; Biochemistry).
Credit Only Granted for: CHEM103, CHEM131, CHEM135, CHEM143, or CHEM146.
Formerly: CHEM143.

CHEM177 Introduction to Laboratory Practices and Research in the Chemical Sciences (2 Credits)
First semester laboratory course required for CHEM and BCHM majors. Introduction to laboratory techniques, including safety practices, scientific ethics, and presentation of current research topics.
Prerequisite: Must have math eligibility of MATH120 or higher.
Corequisite: CHEM146, CHEM131, or CHEM135.
Restriction: Must be in a major within CMNS-Chemistry & Biochemistry department; or permission of CMNS-Chemistry & Biochemistry department.
Credit Only Granted for: CHEM132, CHEM136, CHEM147, or CHEM177.

CHEM231 Organic Chemistry I (3 Credits)
The chemistry of carbon: aliphatic compounds, aromatic compounds, stereochemistry, arenes, halides, alcohols, esters and spectroscopy.
Prerequisite: CHEM131, CHEM135, or CHEM146; and (CHEM132, CHEM136, CHEM147, or CHEM177); and a grade of C- or better in the prerequisites is required of College of Computer, Mathematical, and Natural Sciences majors and recommended for all students.
Corequisite: CHEM232.
Credit Only Granted for: CHEM104, CHEM231, CHEM233 or CHEM237.
Formerly: CHEM233.

CHEM232 Organic Chemistry Laboratory I (1 Credit)
Provides experience in developing some basic laboratory techniques, recrystallization, distillation, extraction, chromatography.
Prerequisite: CHEM131 and CHEM132; or (CHEM135 and CHEM136); or (CHEM146 and CHEM147). And a grade of C- or better in the prerequisites is required for College of Computer, Mathematical, and Natural Sciences majors and recommended for all students.
Corequisite: CHEM231.
Credit Only Granted for: CHEM104, CHEM231, CHEM233 or CHEM237.
Formerly: CHEM233.

CHEM237 Principles of Organic Chemistry I (4 Credits)
The chemistry of carbons: aliphatic compounds, aromatic compounds, stereochemistry, arenes, halides, alcohols, esters, and spectroscopy.
Prerequisite: CHEM131, CHEM135, or CHEM146; and (CHEM132, CHEM136, or CHEM147); and a grade of C- or better in the prerequisites is required of College of Computer, Mathematical, and Natural Sciences majors and recommended for all students. Or permission of CMNS-Chemistry & Biochemistry department.
Restriction: Must be in one of the following programs (Chemistry; Biochemistry) ; or must be in a major in ENGR-A. James Clark School of Engineering.
Credit Only Granted for: CHEM233, (CHEM231 and CHEM232), or CHEM237.

CHEM241 Organic Chemistry II (3 Credits)
A continuation of CHEM231 with emphasis on molecular structure; substitution reactions; carbonium ions; aromaticity; synthetic processes; macromolecules.
Prerequisite: CHEM231 and CHEM232; or CHEM237. And a grade of C- or better in the prerequisites is required for College of Computer, Mathematical, and Natural Sciences majors and recommended for all students.
Credit Only Granted for: (CHEM241 and CHEM242) or CHEM247.

CHEM242 Organic Chemistry Laboratory II (1 Credit)
Synthetic organic chemistry through functional group manipulation, introduction to instrumentation essential to analysis and structure elucidation.
Prerequisite: CHEM231 and CHEM232; or CHEM237. And a grade of C- or better in the prerequisites is required for College of Computer, Mathematical, and Natural Sciences majors and recommended for all students.
Corequisite: CHEM241.
Credit Only Granted for: (CHEM241 and CHEM242) or CHEM247.

CHEM247 Principles of Organic Chemistry II (4 Credits)
A continuation of CHEM237 with emphasis on molecular structure, substitution reactions; carbonium ions; aromaticity; synthetic processes; macromolecules.
Prerequisite: Minimum grade of C- in CHEM237; or permission of CMNS-Chemistry & Biochemistry department.
Restriction: Must be in one of the following programs (Chemistry; Biochemistry) ; or must be an honors student.
Credit Only Granted for: (CHEM241 and CHEM242) or CHEM247.

CHEM271 General Chemistry and Energetics (2 Credits)
An introduction to the physical aspects of chemistry; chemical kinetics, thermodynamics and electrochemistry in the context of current chemistry research.
Prerequisite: CHEM241 and CHEM242; or CHEM247. And a grade of C- or better in the prerequisites for College of Computer, Mathematical, and Natural Sciences majors and recommended for all students.
Corequisite: CHEM272.
Credit Only Granted for: CHEM113, CHEM153, CHEM271 or CHEM276.
Formerly: CHEM113.

CHEM272 General Bioanalytical Chemistry Laboratory (2 Credits)
An introduction to analytical chemistry with an emphasis on bio-analytical instrumentation and techniques.
Prerequisite: CHEM241 and CHEM242; or CHEM247. And a grade of C- or better in the prerequisites is required for College of Computer, Mathematical, and Natural Sciences majors and recommended for all students.
Corequisite: CHEM271.
Credit Only Granted for: CHEM227, CHEM272 or CHEM277.

CHEM276 General Chemistry and Energetics - Majors (2 Credits)
An introduction to the physical aspects of chemistry for Biochemistry and Chemistry majors. Chemical kinetics, thermodynamics and electrochemistry in the context of current chemistry research.
Prerequisite: Minimum grade of C- in CHEM241 and CHEM242; or minimum grade of C- in CHEM247.
Corequisite: CHEM277.
Restriction: Must be in one of the following programs (Chemistry; Biochemistry).
Credit Only Granted for: CHEM113, CHEM153, CHEM271 or CHEM276.
Formerly: CHEM153.

CHEM277 Fundamentals of Analytical and Bioanalytical Chemistry Laboratory (3 Credits)
Quantitative analysis, inorganic analytical chemistry, and an introduction to bio-analytical instrumentation and techniques.
Prerequisite: Minimum grade of C- in CHEM241 and CHEM242; or minimum grade of C- in CHEM247.
Corequisite: CHEM276.
Restriction: Must be in one of the following programs (Chemistry; Biochemistry).
Credit Only Granted for: CHEM153, CHEM227, CHEM272 or CHEM277.

CHEM298 Special Topics in Chemistry (3 Credits)
Course topics to be determined by instructor.

CHEM298Q Quantum Steampunk Science-Fiction Workshop (3 Credits)
Steampunk is a science-fiction genre in which futuristic technologies populate Victorian-era settings. Recently, steampunk has come to life in the scientific field of quantum thermodynamics. Thermodynamics, the study of energy, grew out of the Industrial Revolution. Two centuries later, quantum physics is transforming computing and cryptography. Quantum science is now revolutionizing 19th-century thermodynamics in quantum thermodynamics, which features quantum engines, automata, and more. Quantum thermodynamics inspired the growing subgenre of quantum steampunk. In this course, you will read science fiction, write quantum steampunk short stories, receive feedback, and critique classmates' writing. In parallel, you will learn about quantum physics, technologies, and thermodynamics.
Cross-listed with: ARHU270, CMSC298Q, ENGL289Q, ENME299Q, PHYS299Q.
Credit Only Granted for: ARHU270, ARHU298Q, CHEM298Q, CMSC298Q, ENGL289Q, ENME299Q or PHYS299Q.

CHEM316 Chemical Demonstrations and Outreach (1 Credit)
The purpose of this course is to provide students with the experience, skills, and knowledge of performing chemical demonstrations. The goal is to illustrate chemical principles using engaging and visually stimulating experiments. There will be an emphasis on safety and understanding the chemistry behind how each chemical demonstration works. In addition to learning experiments, students will be expected to perform an outreach project.
Prerequisite: (CHEM241 and CHEM242) or CHEM247; and (CHEM271 or CHEM276) and (CHEM272 or CHEM277).
Restriction: Permission of the Chemistry and Biochemistry Department.

CHEM386 Experiential Learning (3-6 Credits)
Prerequisite: Learning Proposal approved by the Office of Experiential Learning Programs, faculty sponsor, and student's internship sponsor.
Restriction: Junior standing or higher.

CHEM389 Pedagogy and Instruction in Chemistry (1-2 Credits)
Methodologies, theory and educational tools applicable to the field of undergraduate chemistry education. Examples covered will use content from introductory general and organic chemistry courses.
Prerequisite: Permission of instructor; and minimum grade of B- in CHEM231; and must have completed or be concurrently enrolled in CHEM241.
Repeatable to: 6 credits.

CHEM395 Professional Issues in Chemistry and Biochemistry (1 Credit)
Seminar on professional issues. Professional responsibilities, ethics, interview techniques, career opportunities, graduate/professional school, race and gender issues.
Restriction: Junior standing or higher; and must be in one of the following programs (Chemistry; Biochemistry).

CHEM398 Special Projects (2 Credits)
Honors projects for undergraduate students.

CHEM399 Introduction to Chemical Research (1-3 Credits)
Basic (chemical) research conducted under the supervision of a faculty member.
Restriction: Junior standing or higher; and permission of CMNS-Chemistry & Biochemistry department.
Repeatable to: 6 credits.

CHEM401 Inorganic Chemistry (3 Credits)
An overview of basic concepts of the electronic structure of the elements, chemical bonding and reactivity, from simple diatomic molecules to coordination compounds. These are viewed from simple (Lewis) to the most comprehensive molecular orbital theory. Symmetry and group theory are used throughout the course.
Prerequisite: CHEM276 or CHEM271; and (CHEM247 or CHEM241).

CHEM403 Radiochemistry (3 Credits)
Radioactive decay; introduction to properties of atomic nuclei; nuclear processes in cosmology; chemical, biomedical and environmental applications of radioactivity; nuclear processes as chemical tools; interaction of radiation with matter.
Prerequisite: Must have completed one year of college chemistry and one year of college physics.

CHEM425 Instrumental Methods of Analysis (4 Credits)
Modern instrumentation in analytical chemistry. Electronics, spectroscopy, chromatography and electrochemistry.
Prerequisite: CHEM272 and CHEM271; or (CHEM276 and CHEM277).

CHEM433 Atmospheric Chemistry and Climate (3 Credits)
The effects of human activity on atmospheric composition, focused on global warming, the carbon cycle, air pollution, and the ozone layer. Fundamentals of atmosphereic chemistry (spectroscopy, kinetics, isotopic analysis, and biogeochemical cycles) are related to the modern understanding of climate change, air quality, and ozone depletion, based on resources such as satellite missions, field campaigns, and scientific assessments published by international agencies. We also examine how society's energy needs could be met, in the future, in a manner with less impact on atmospheric composition than the present heavy reliance on combusion of fossil fuels.
Prerequisite: CHEM131, CHEM135, or CHEM146. And MATH241; or permission of CMNS-Atmospheric & Oceanic Science department; or permission of CMNS-Chemistry & Biochemistry department. Cross-listed with AOSC433.
Credit Only Granted for: AOSC433, AOSC633, CHEM433, or CHEM633.
Formerly: CHEM434.

CHEM441 Advanced Organic Chemistry (3 Credits)
An advanced study of the compounds of carbon, with special emphasis on molecular orbital theory and organic reaction mechanisms.
Prerequisite: Must have completed or be concurrently enrolled in CHEM480 or CHEM481; and 1 course with a minimum grade of C- from (CHEM241, CHEM247).
Jointly offered with: CHEM641.

CHEM460 Structure Determination Using Spectroscopic Methods (3 Credits)
The use of infrared, ultraviolet-visible, proton and carbon-13 nuclear magnetic resonance and mass spectroscopy for structure determination in organic chemistry.
Prerequisite: Must have completed CHEM243; or CHEM247; or (CHEM241 and CHEM242).
Formerly: CHEM660.

CHEM471 Techniques in Pulse NMR (1 Credit)
NMR techniques to operate, adjust, and calibrate the spectrometers and acquire and process NMR data in one and two dimensional NMR applications.
Prerequisite: CHEM241 and CHEM242; or CHEM247.
Recommended: CHEM460.
Restriction: Senior standing or higher.
Additional Information: Persons with heart pacemakers and/or metal implants cannot take the course due to potential health hazards.

CHEM480 Principles of Physical Chemistry (3 Credits)
Covers elementary thermodynamics, principles of kinetics and catalysis and selected topics in molecular quantum mechanics, spectroscopy and statistical mechanics. Topics will emphasize core subjects along with applications to biosciences, materials science, environmental science and related areas.
Prerequisite: (CHEM276 or CHEM271); and (CHEM277 or CHEM272); and (MATH140 or MATH136); and (PHYS260 and PHYS261) or PHYS132.
Credit Only Granted for: CHEM480 or CHEM481; CHEM480, BCHM485 or CHEM482.

CHEM481 Physical Chemistry I (3 Credits)
Thermodynamics and kinetics of chemical and molecular systems. Topics may include internal energy, heat, work, enthalpy, entropy, free energy, and spontaneity as well as reaction order, differential rate laws, integrated rate laws, and rate laws for multi-step processes.
Prerequisite: Minimum grade of C- in CHEM135; or minimum grade of C- in CHEM271 and CHEM272; or minimum grade of C- in CHEM276 and CHEM277. And minimum grade of C- in MATH141. And minimum grade of C- in PHYS260 and PHYS261; or minimum grade of C- in PHYS142.
Credit Only Granted for: CHEM481 or CHEM480.

CHEM482 Physical Chemistry II (3 Credits)
Quantum mechanical nature of atoms and molecules. Topics may include model systems for electronic, vibrational, rotational and translational energies as well as connections to molecular spectroscopy and thermal distributions.
Prerequisite: Minimum grade of C- in CHEM135; or minimum grade of C- in CHEM271 and CHEM272; or minimum grade of C- in CHEM276 and CHEM277. And minimum grade of C- in MATH141. And minimum grade of C- in PHYS260 and PHYS261; or minimum grade of C- in PHYS142.
Credit Only Granted for: CHEM482, BCHM485 or CHEM480.

CHEM483 Physical Chemistry Laboratory I (2 Credits)
An introduction to the principles and application of quantitative techniques in physical chemical measurements. Experiments will be coordinated with topics in CHEM481.
Prerequisite: Must have completed or be concurrently enrolled in CHEM481.

CHEM484 Physical Chemistry Laboratory II (2 Credits)
Advanced quantitative techniques necessary in physical chemical measurements. Experiments will be coordinated with topics in CHEM 482.
Prerequisite: Must have completed or be concurrently enrolled in CHEM482.

CHEM498 Special Topics in Chemistry (3 Credits)
Prerequisite: Prerequisite varies with the nature of the topic being considered.

CHIN - Chinese

CHIN100 Introduction to Chinese Language and Culture (3 Credits)
An introduction to the Chinese language and Chinese culture, covering the linguistic, ethnic, and religious diversity of China, and to explore the rich nuances of Chinese culture. The curriculum covers a wide range of topics, including the origins and evolution of Chinese characters, poetry, philosophy, calligraphy, and painting.

CHIN101 Intensive Elementary Chinese I (6 Credits)
Introduction to speaking, reading, and writing Chinese with an emphasis on mastering the essentials of pronunciation, basic characters and structural patterns.
Prerequisite: Must have attained appropriate World Language Placement Test (WLPT) score.

CHIN102 Elementary Spoken Chinese (3 Credits)
Continued study of grammatical patterns and vocabulary buildup with particular emphasis on conversation.
Prerequisite: CHIN101; or students who have taken courses with comparable content may contact the department; or must have attained appropriate World Language Placement (WLP) score.
Corequisite: CHIN103.
Additional Information: Must be taken in conjunction with CHIN103.

CHIN103 Elementary Written Chinese (3 Credits)
Continued study of grammatical patterns and buildup of vocabulary with particular emphasis on reading and writing.
Prerequisite: CHIN101; or students who have taken courses with comparable content may contact the department; or must have attained appropriate World Language Placement Test (WLPT) score.
Corequisite: CHIN102.
Additional Information: Must be taken in conjunction with CHIN102.

CHIN105 Elementary Chinese - Accelerated Track (3 Credits)
Accelerated instruction in Mandarin Chinese at the elementary level for students with prior Chinese language background, either through home use or formal instruction.
Prerequisite: Must have appropriate World Language Placement (WLP) score.
Restriction: Must not have completed CHIN103, CHIN102, or CHIN101.

CHIN121 Elementary Chinese I (4 Credits)
Introduces Chinese phonetic system and writing system; develops students' Chinese proficiency on the basic linguistic skills of listening, speaking, reading and writing as well as their cultural competence.
Prerequisite: ACTLF Novice Low proficiency in all language skills, or must have attained appropriate World Language Placement score.
Credit Only Granted for: CHIN121 or CHIN101.
Formerly: CHIN101.

CHIN122 Elementary Chinese II (4 Credits)
Develops students' communicative competence to ACTFL Novice Mid/ High level of proficiency. Introduces students to Chinese culture.
Prerequisite: CHIN121; or must have attained appropriate World Language Placement score.
Credit Only Granted for: CHIN122 or (CHIN102 and CHIN103).
Formerly: CHIN102.

CHIN169 Special Topics in Study Abroad I (1-6 Credits)
Special topics course taken as part of an approved study abroad program.
Repeatable to: 15 credits if content differs.

CHIN201 Intermediate Spoken Chinese I (3 Credits)
Emphasis on development of conversational skills with vocabulary build-up and controlled conversation.
Prerequisite: CHIN102; or must have attained appropriate World Language Placement (WLP) score.
Corequisite: CHIN202.
Additional Information: Must be taken in conjunction with CHIN202.

CHIN202 Intermediate Written Chinese I (3 Credits)
Reading and writing skills with emphasis on grammar and Chinese characters.
Prerequisite: CHIN103; or must have attained appropriate World Language Placement (WLP) score.
Corequisite: CHIN201.
Additional Information: Must be taken in conjunction with CHIN201.

CHIN203 Intermediate Spoken Chinese II (3 Credits)
Continuation of CHIN201.
Prerequisite: CHIN201; or students who have taken courses with comparable content may contact the department; or must have attained appropriate World Language Placement (WLP) score.
Corequisite: CHIN204.
Additional Information: Must be taken in conjunction with CHIN204.

CHIN204 Intermediate Written Chinese II (3 Credits)
Continuation of CHIN202.
Prerequisite: CHIN202; or students who have taken courses with comparable content may contact the department; or must have attained appropriate World Language Placement (WLP) score.
Corequisite: CHIN203.
Additional Information: Must be taken in conjunction with CHIN203.

CHIN205 Intermediate Chinese - Accelerated Track (3 Credits)
Accelerated instruction in Mandarin Chinese at the intermediate level for students with prior Chinese language background, either through home use or formal instruction.
Prerequisite: Must have attained appropriate World Language Placement (WLP) score.
Restriction: Must not have completed CHIN201, CHIN203, CHIN202, or CHIN204.

CHIN269 Special Topics in Study Abroad II (1-6 Credits)
Special topics course taken as part of an approved study abroad program.
Repeatable to: 15 credits if content differs.

CHIN301 Advanced Chinese I (3 Credits)
Readings in expository and fictional writing with conversation and composition.
Prerequisite: CHIN203 and CHN204; or CHIN207; or students who have taken courses with comparable content may contact the department.

CHIN302 Advanced Chinese II (3 Credits)
Continuation of CHIN301.
Prerequisite: CHIN301; or students who have taken courses with comparable content may contact the department. And must have taken a placement interview offered by the department for Non-majors.

CHIN305 Life in China through TV Plays I (3 Credits)
Using authentic Chinese language material in short TV plays to learn about society and life in China.
Prerequisite: CHIN203 and CHIN204; or permission of ARHU-School of Languages, Literatures, and Cultures department.

CHIN306 Life in China through TV Plays II (3 Credits)
Continuation of CHIN305 using authentic Chinese language material in TV plays to learn about society and life in China.
Prerequisite: CHIN305; or permission of ARHU-School of Languages, Literatures, and Cultures department.

CHIN307 Linguistic Landscape of China (3 Credits)
Comprehensive introduction to Chinese and other major languages in the Sino-Tibetan, Altaic, Austroasiatic, and Austronesian families, all of which are spoken in China. Taught in English.
Prerequisite: Must have completed CHIN204 or above; or permission of Chinese Program Advisor.

CHIN313 Chinese Poetry and Prose in Translation (3 Credits)
Writing of the major poets, essayists, and historians from the 10th century B.C. to the 12th century A.D. No knowledge of Chinese is required.

CHIN315 Modern Chinese Literature in Translation (3 Credits)
Major works of fiction and drama from 1920 to the present read in the context of social and literary change. Emphasis on western and traditional Chinese influences on the writers and their works. No knowledge of Chinese required.

CHIN331 Chinese Calligraphy: Theory and Practice (3 Credits)
History of the writing system; major scripts, modes, and styles. Intermediate brushwork and lectures on the culture. Characters for practice selected to correspond to lecture topics. Taught in English.
Prerequisite: CHIN220; or permission of instructor.

CHIN332 Chinese Culture through Traditional Chinese Arts (3 Credits)
Study of calligraphy, music, painting, and taichi coupled with critical readings of scholarly and literary texts. Facilitates an understanding of China and Chinese culture through traditional Chinese arts. Taught in English.

CHIN369 Special Topics in Study Abroad III (1-6 Credits)
Special topics course taken as part of an approved study abroad program.
Repeatable to: 15 credits if content differs.

CHIN386 Experiential Learning (3-6 Credits)
Prerequisite: Must have learning proposal approved by the Office of Experiential Learning Programs, faculty sponsor, and student's internship sponsor.
Restriction: Junior standing or higher.

CHIN388 Topics in Chinese Literature in Translation (3 Credits)
Analysis of significant themes and structures in Chinese literature. No knowledge of Chinese required.
Repeatable to: 6 credits if content differs.

CHIN389 Language House Spring Colloquium (1 Credit)
For students residing in the Language House Immersion Program. Focuses on the development of skills in the target language and acquiring the cultural knowledge of the countries that speak the target language.
Restriction: Must be a resident of Language House.
Repeatable to: 8 credits.

CHIN401 Readings in Modern Chinese I (3 Credits)
Readings in history, politics, economics, sociology, and literature. Emphasis on wide-ranging, rapid reading, reinforced by conversations and compositions.
Prerequisite: CHIN302; or students who have taken courses with comparable content may contact the department. And must have taken a placement interview offered by the department for Non-majors.

CHIN402 Readings in Modern Chinese II (3 Credits)
Continuation of CHIN401.
Prerequisite: CHIN401; or students who have taken courses with comparable content may contact the department. And must have taken a placement interview offered by the department for Non-majors.

CHIN403 Classical Chinese I (3 Credits)
Close readings and discussion of literary, philosophical and historical texts in the original language. The course situates texts in their historical context and also discusses differences between classical and modern Chinese.
Prerequisite: CHIN302 or CHIN306; or permission of instructor.
Additional Information: Texts in Chinese. Class discussion and course work mainly in English.

CHIN408 Selected Readings in Classical Chinese (3 Credits)
Selected readings in Classical Chinese, including important representative works of history, poetry, and parallel prose. Close attention is paid to matters of grammar and phonology in the readings. Content will differ each time this course is offered.
Prerequisite: CHIN321; and must have knowledge of Pinyin.
Repeatable to: 9 credits if content differs.

CHIN411 Business Chinese I (3 Credits)
Conversation, reading, and writing applicable to Chinese business transactions, social meetings, and meetings with government organizations, plus background material in English on professional business practices and social customs associated with business.
Prerequisite: CHIN402; or permission of ARHU-School of Languages, Literatures, and Cultures department. And must have taken a placement interview offered by the department for Non-majors.

CHIN415 Readings in Current Newspapers and Periodicals (3 Credits)
Reading of periodical literature on selected topics with discussions and essays in Chinese.
Prerequisite: CHIN402; or students who have taken courses with comparable content may contact the department. And must have taken a placement interview offered by the department for Non-majors.

CHIN418 Special Topics in Contemporary Chinese Fiction and Film (3 Credits)
Various approaches to the most recent textual productions of China and Taiwan. Taught in Chinese.
Prerequisite: Permission of ARHU-School of Languages, Literatures, and Cultures department.
Repeatable to: 12 credits if content differs.

CHIN425 Ethnic and Cultural Diversity in China (3 Credits)
This course looks into ethnic and cultural diversity in China. It examines the evolution of the People's Republic of China's (PRC) ethnic policies in relation to nation-state building over the last six decades. Specifically, it studies how the PRC has categorized the Chinese people into 56 ethnic groups, how it has made affirmative action policies to accommodate ethnic diversity, and what problems its approaches have experienced and what solutions it has proposed in its accommodation of ethnicity and diversity in the 21st century. To examine the above issues, the course introduces and applies the concepts of ethnicity, nationality, ethnic nationalism, civic nationalism, identity, social Darwinism, the Soviet model of multinational state building, the Chinese model of inclusive Chinese nation state building, citizenship, individual rights, group rights, equality, and diversity.
Recommended: Any CHIN course or course on China.

CHIN428 Selected Topics in Chinese Linguistics (3 Credits)
Undergraduate seminar in Chinese linguistics. Topics may include the ancient writing system, historical phonology, dialectology, prosody and rhyming, grammar and the history of the language as a whole. This course may be repeated with different content, and satisfies the linguistics requirement for the Chinese major. Students are expected to be in at least Third Year Chinese. Taught in English.
Prerequisite: Permission of ARHU-School of Languages, Literatures, and Cultures department.
Restriction: Sophomore standing or higher.
Repeatable to: 12 credits if content differs.

CHIN429 Selected Topics in Chinese Studies (3 Credits)
In-depth study of a particular aspect of Chinese cultural, linguistic, literary studies. Specific topic to be announced when course is offered. Taught in English.
Prerequisite: CHIN315.
Repeatable to: 6 credits if content differs.

CHIN441 Traditional Chinese Fiction (3 Credits)
Major works of fiction from the 4th century tales of the marvelous through the 19th century Qing novel. Readings are in classical Chinese and English. Designed for students with advanced language skills. Taught in English.
Prerequisite: Permission of ARHU-School of Languages, Literatures, and Cultures department.

CHIN443 Cultural Histories of Medicine in China (3 Credits)
Investigates medical knowledge through traditional Chinese approaches to the body and beliefs about healing, including acupuncture, herbal medicine, prayer, ritual and folk medicine. Taught in English.
Restriction: Permission of department, School of Languages, Literatures and Cultures.

CHIN499 Directed Study in Chinese (1-3 Credits)
Readings in Chinese under faculty supervision.
Prerequisite: Permission of instructor.
Repeatable to: 6 credits if content differs.

CINE - Cinema and Media Studies

CINE245 Film Form and Culture (3 Credits)
Introduction to film as art form and how films create meaning. Basic film terminology; fundamental principles of film form, film narrative, and film history. Examination of film technique and style over past one hundred years. Social and economic functions of film within broader institutional, economic, and cultural contexts.
Cross-listed with: ENGL245.
Credit Only Granted for: ENGL245, CINE245 or FILM245.
Formerly: FILM245.

CINE280 Film Art in a Global Society (3 Credits)
Comparative study of a variety of film traditions from around the world, including cinema from Hollywood, Europe, Asia and developing countries, with a stress on different cultural contexts for film-making and viewing.
Cross-listed with: CMLT280.
Credit Only Granted for: CINE280, FILM298D or CMLT280.
Formerly: FILM298D.

CINE282 Heroes and Villains in American Film (3 Credits)
We will examine the complex, changing, and ever-present representations of heroes and villains in American film. Beginning with a foundational understanding of how heroes and, conversely, villains have been defined through classic Hollywood film, we will explore how these definitions have shifted throughout the 20th and 21st century in various narrative genres, including westerns, war films, film noir, fantasy, science fiction, and, of course, superhero movies. In particular, we will be focusing on how the hero and villain maintain or disrupt specific cultural ideologies concerning race/ethnicity, gender, sexuality, and ability. This course will examine how these various ideologies have evolved throughout the 20th and 21st century, impacting the ways in which heroes and villains are both represented in American film and perceived by diverse audiences. Finally, we will examine our own complicated and sometimes troubling identification with these heroes, even when they might stand in stark contrast to our cultural values and identities.
Cross-listed with: AMST213.
Credit Only Granted for: AMST213, HONR219F, CINE282 or FILM298V.
Formerly: HONR219F, FILM298V.

CINE283 Iranian Cinema (3 Credits)
Introduction to Iranian cinema, society, and culture. Taught in English.
Cross-listed with: PERS283.
Credit Only Granted for: PERS283, CINE283 or FILM298B.

CINE298 Special Topics in International Film Studies (3 Credits)
Special topics in International Film.
Repeatable to: 9 credits if content differs.
Formerly: FILM298.

CINE301 Cinema History I: The Silent Era (3 Credits)
Examines the development of silent cinema from the 1890s to the early 1930s drawing on at least five distinct national traditions (French, German, Russian, British, and American). Introduces students to key cinematic conventions as they emerged around the world.
Prerequisite: ENGL245, CINE245, or FILM245; or permission of ARHU-College of Arts & Humanities.
Credit Only Granted for: CINE301 or FILM301.
Formerly: FILM301.

CINE302 Cinema History II: The Sound Era (3 Credits)
Introduction to the international history of cinema from sound around 1930 to the present.
Prerequisite: ENGL245, FILM245, or CINE245.
Restriction: Must have permission of the Film Studies program.
Credit Only Granted for: CINE302 or FILM302.
Formerly: FILM302.

CINE310 Introduction to Filmmaking 1 (3 Credits)
This practice-based course offers an introduction to the foundational skills, techniques, and principles of filmmaking. Prior film or video production experience is not necessary.
Restriction: Permission of the Cinema and Media Studies program.
Credit Only Granted for: CINE319M or CINE310.
Formerly: CINE319M.

CINE311 Documentary Film (3 Credits)
A survey of currents in the history of the documentary film, beginning with early cinema and continuing through to more recent manifestations.
Prerequisite: ENGL245, FILM245, or CINE245; or permission of ARHU-College of Arts & Humanities.
Credit Only Granted for: CINE311, FILM311 or ENGL329L.
Formerly: FILM311.

CINE315 Editing for Film and Media (3 Credits)
Provides advanced training for students to edit their narrative, documentary, or animation projects, as well as reference material. Students will learn to design their film's visual storytelling, taking their projects from the shooting script and storyboard to rough cuts and picture look.
Prerequisite: CINE245 or ENGL245.
Corequisite: CINE310.
Restriction: Permission of Cinema and Media Studies Program.

CINE316 Classical Antiquity and the Cinema (3 Credits)
Many films, while rooted in the time and place in which they were created, draw upon themes and stories from ancient Greek and Roman literature. While the filmmakers' understandings of modern social forces affect their representations of the ancient world, the ancient works also shape the ways in which filmmakers tell their stories. Film criticism and close reading complement each other in the analysis of films and the ancient works on which they are based.
Cross-listed with: CLAS316.
Credit Only Granted for: CLAS316 or CINE316.

CINE317 Introduction to Sound Design (3 Credits)
An introduction to sound editing and sound design. The course examines the place of sound in cinema, both artistic and technological. The course will cover the basics of sound, microphones, and analogue-to-digital conversion. Lectures, readings, and film clips will be used to illustrate the language of film sound, as practiced by film directors, sound designers, and editors
Prerequisite: CINE245 or ENGL245.
Corequisite: CINE310.
Restriction: Permission of Cinema and Media Studies Program.

CINE319 Special Topics in Documentary, Animation, Experimental Cinema, and Other Visual Media (3 Credits)
Examine the possibilities of non-narrative cinema, or cinema that is structured differently from the fiction feature film, as well as other media (television, digital imagery, and photography) that entertain a close relationship with cinema in terms of form, content, and audience. Content varies.
Repeatable to: 6 credits.
Formerly: FILM319.

CINE329 Special Topics in National/International Cinemas (3 Credits)
Examine one or more national cinematic traditions (including Hollywood cinema), or may look across traditions comparatively, for example at international and/or transnational phenomena. Content varies.
Repeatable to: 6 credits.
Formerly: FILM329.

CINE331 Kafka and Film: The Uncanny in Literature and Film (3 Credits)
Analysis of major works by Franz Kafka (1883-1924), his affinity to the cinema and use of cinematic means and techniques (e.g. the gaze, flashback, parallel action, gesture and body language, etc.) in his writings, as well as examination of adaptations of Kafka narratives (e.g. the Orson Welles and David Jones adaptations of The Trial, 1961, 1992) and other films that use Kafkaian themes (e.g. Steven Soderbergh's 'Kafka', 1991).
Cross-listed with: GERS331.
Credit Only Granted for: GERM331, GERS331, or CINE331.

CINE332 Brazilian Cinema (3 Credits)
Brazilian films from the late 1950s to the present with a special view to the relationship between cinema, society, historical dates, and social changes in Brazil. Taught in English.
Cross-listed with: PORT332.
Credit Only Granted for: PORT332, CINE332, or FILM332.
Formerly: FILM332.

CINE334 Soviet Film: Propaganda, Myth, Modernism (3 Credits)
A Survey of Soviet film from the 1920s to 1991, focusing on important directors, genres, themes, and styles. Taught in English.
Cross-listed with: RUSS334.
Credit Only Granted for: RUSS334, CINE334, or FILM334.
Formerly: FILM334.

CINE335 Transnational Chinese Cinema (3 Credits)
Chinese cinema has made a big impact on contemporary world film culture. This course will introduce students to the films directed by some of the most representative filmmakers working in different geopolitical locations (mainland China, Taiwan, Hong Kong) and the Chinese diaspora. The films of these directors, in a spectrum of genres, themes, and styles, have inspired global scholarship, not only in visual culture and cinema, but also in the study of women's issues, gender and ethnic studies, as well as the fields of adaptation and intermedia studies. Students will explore these films in their socio-historical and artistic contexts, considering the influences and innovations that have shaped them and analyzing their reception by audiences and critics. After reading about the films they view, and participating in class discussions, students will be ready to complete their analytical written assignments, for which they will critically examine the films by applying key concepts such as gender, sexuality, race, gaze, style, representation, power, diaspora, etc.
Cross-listed with: ARTH391.
Credit Only Granted for: ARTH391 or CINE335.

CINE336 Soviet Cinema and Empire (3 Credits)
Examination of the concepts of "empire" and "nation" through their representation in Soviet cinema. Taught in English.
Cross-listed with: RUSS336.
Credit Only Granted for: RUSS336, CINE336, or FILM336.
Formerly: FILM336.

CINE337 Contemporary Chinese Art and Film (3 Credits)
Contemporary Chinese art and film are arguably the most vibrant of all national arts at the turn of the millennium and have become the face - both figuratively and literally - of contemporary China, a complex society with historic overlays of Confucianism, Taoism, Buddhism, Communism, Post-socialism, and state capitalism. Students will consider a wide range of art forms (painting, photography, video, installation, web-based media, and film) in four broad themes (uses of the past; critiques of power; representations of race, gender, and sexuality; socially engaged art) and explore the complex intertwining of the political, historical, and aesthetic aspects in Chinese contemporary art and film, as well as the multiple contexts in which these artworks are created and circulated.
Cross-listed with: ARTH392.
Credit Only Granted for: ARTH392, FILM329L or CINE337.
Formerly: FILM329L.

CINE341 Filming War Zones: Representations of Wars in Iraq & Chechnya (3 Credits)
Comparative study of ideological and cultural discourses in war films covering military conflicts in Iraq and Chechnya in late 20th-early 21st centuries. Materials include American, Middle Eastern, and Russian feature films and documentaries; theories of propaganda, ideology and popular culture. Taught in English.
Cross-listed with: ARAB341.
Credit Only Granted for: ARAB341, CINE341 or FILM341.
Formerly: FILM341.

CINE342 Film Comedy (3 Credits)
Comedy as a specific cinematic genre.
Prerequisite: ENGL245, FILM245, or CINE245; or permission of ARHU-School of Languages, Literatures, and Cultures department.
Cross-listed with: SLLC342.
Credit Only Granted for: SLLC342, CINE342, or FILM342.
Formerly: FILM342.

CINE344 Film and the Fantastic (3 Credits)
Survey of fantastic cinema, encompassing American classics, Hollywood recent productions, and independent films, as well as Asian horror films, anime, and European fantasy.
Prerequisite: ENGL245, FILM245, or CINE245; or permission of ARHU-School of Languages, Literatures, and Cultures department.
Cross-listed with: SLLC344.
Credit Only Granted for: SLLC344, CINE344 or FILM344.
Formerly: FILM344.

CINE345 The Films of Alfred Hitchcock (3 Credits)
An examination of important Hitchcock films from the perspective of innovation, aesthetics, and cultural history.
Prerequisite: ENGL245, FILM245, or CINE245; or permission of ARHU-College of Arts & Humanities.
Credit Only Granted for: CINE345, FILM345 or ENGL329J.
Formerly: FILM345.

CINE352 The Baddest Decade: The 1970s in American Film and American History (3 Credits)
The history of the United States and of its cinema in the 1970s.
Cross-listed with: HIST304.
Credit Only Granted for: CINE352, FILM352 or HIST304.
Formerly: FILM352.

CINE355 New Waves of the Soviet Bloc (3 Credits)
Considers the possibilities and challenges of cinema in a particular historical moment: the "new waves" of the "Soviet bloc" in the 1960s, from Poland, Czechoslovakia, Hungary, and Yugoslavia, to the Soviet Union itself, including the non-Russian republics. Taught in English.
Cross-listed with: RUSS355.
Credit Only Granted for: CINE355, RUSS355, RUSS398D, CINE359O or FILM359O.
Formerly: CINE359O.

CINE359 Special Topics in Genres/Auteurs/Cinema Movements (3 Credits)
Examine narrative cinema from the perspective of content (themes, issues, structures) and style through the lens of genre, auteurship (a concept of authorship in film studies), and/or historical aesthetic movements that have been influential in the development of cinema as an art and film studies as a field. Content varies.
Repeatable to: 6 credits.
Formerly: FILM359.

CINE361 Cinema and Globalization (3 Credits)
Introduction to cinema as a global phenomenon.
Prerequisite: ENGL245, FILM245, or CINE245; or permission of Film Studies program; or permission of ARHU-School of Languages, Literatures, and Cultures department.
Cross-listed with: SLLC361.
Credit Only Granted for: SLLC361, CINE361, or FILM361.
Formerly: FILM361.

CINE362 Vision, Visuality, and the Gaze in Cinema (3 Credits)
Students will build a way of talking critically about film. The prism of seeing, visuality, the gaze, and the like will serve as a way to investigate the way films take on meaning as well as to understand how film participates in a wide network of interconnected ideas, concepts, and modes of thought that have contributed to the audiences' ability to make sense of what a film is conveying.
Prerequisite: ENGL245, FILM245 or CINE245; or permission of Film Studies Program; or permission of ARHU-School of Languages, Literatures, and Cultures department.
Cross-listed with: SLLC362.
Credit Only Granted for: SLLC362, CINE362, or FILM362.
Formerly: FILM362.

CINE369 Special Topics in Film Theories (3 Credits)
Examines specific methodologies (structuralism, feminism, postcolonialism, etc.) for the critical analysis of film. The course will also consider the historical development of theoretical concepts. Content varies.
Repeatable to: 6 credits if content differs.
Formerly: FILM369.

CINE376 Writing the Feature Film (3 Credits)
Examines the creative process of developing and writing a feature-length screenplay. Students will experience a collaborative workshop environment, researching stories, pitching feature film ideas, creating a logline, developing a detailed beat sheet and, ultimately, writing a complete first draft of the screenplay.
Prerequisite: ENGL275, ARHU275, ARHU375 or THET340; or permission of instructor.
Cross-listed with: ARHU376.
Credit Only Granted for: ARHU376 or CINE376.

CINE385 German Cinema (3 Credits)
A history of German cinema from the golden age of silent films to the flourishing film culture of the 21st Century. Focuses on changing ideas of the role and purpose of national cinema, as well as the cinematic representation of nation and national identity. Taught in English.
Cross-listed with: GERS385.
Credit Only Granted for: GERM385, GERS385, CINE385 or FILM385.
Formerly: FILM385.

CINE388 Experiential Learning: Cinema and Media Studies (1-3 Credits)
Connects students' theoretical understanding of film studies, as obtained through the classroom, to professional experience.
Prerequisite: Permission of ARHU-School of Languages, Literatures, and Cultures department.
Restriction: Junior standing or higher.
Repeatable to: 6 credits.
Formerly: FILM388.

CINE410 Documentary and Narrative (3 Credits)
An examination of the relationship between film and reality, focusing on documentary film.
Prerequisite: ENGL245, FILM245, or CINE245; or permission of ARHU-School of Languages, Literatures, and Cultures department.
Cross-listed with: SLLC410.
Credit Only Granted for: SLLC410, CINE410 or FILM410.
Formerly: FILM410.

CINE411 Experimental Film (3 Credits)
Introductory survey of European and U.S. American experimental cinema.
Cross-listed with: SLLC411.
Credit Only Granted for: SLLC411, CINE411 or FILM411.
Formerly: FILM411.

CINE412 Animation and Cinema (3 Credits)
An examination of animation in art, cinema, and other media.
Prerequisite: ENGL245, FILM245, or CINE245; or permission of ARHU-College of Arts & Humanities.
Credit Only Granted for: CINE412, FILM412 or ENGL468C.
Formerly: FILM412.

CINE415 Advanced Filmmaking (3 Credits)
Implementing the process of moving from film script through production to a complete film with an emphasis on conceptualization, aesthetics, advanced production techniques, directing, and finishing touches. Students in the course are expected to produce an original film project based on significant collaborative work.
Prerequisite: CINE245 or ENGL245; and CINE310.
Restriction: Permission of Cinema and Media Studies Program.

CINE419 Special Topics in Documentary, Animation, Experimental Cinema, and Other Media (3 Credits)
Advanced studies in Documentary, Animation, Experimental Cinema, and Other Media. Examines the possibilities of non-narrative cinema, or cinema that is structured differently from the fiction feature film, as well as other media (television, digital imagery, and photography) that entertain a close relationship with cinema in terms of form, content, and audience. Content varies.
Prerequisite: ENGL245, FILM245, or CINE245; and or permission of ARHU College of Arts and Humanities.
Repeatable to: 6 credits if content differs.
Formerly: FILM419.

CINE420 French Cinema: A Cultural Approach (in Translation) (3 Credits)
A study of French culture, civilization, and literature through the medium of film. Taught in English.
Cross-listed with: FREN480.
Credit Only Granted for: FREN480, CINE420 or FILM420.
Formerly: FILM420.

CINE421 Francophone African Film (3 Credits)
Imaginary and Memory in the reality of Francophone African Film from 1960-present. Taught in English.
Cross-listed with: FREN421.
Credit Only Granted for: FREN421, CINE421 or FILM421.
Formerly: FILM421.

CINE423 Women and French Cinema (3 Credits)
Cultural identity, social boundaries and gender roles in French film as well as introduction to film textual analysis and diverse film theories (semiotics, film and psychoanalysis, feminist film theory, structuralism, narratology, spectatorship and cultural studies). Taught in English.
Cross-listed with: FREN423.
Credit Only Granted for: FREN423, CINE423 or FILM423.
Formerly: FILM423.

CINE426 Modern Chinese Film and Visual Culture (3 Credits)
Modern Chinese culture, society, and history studied through examples of art, film, and visual culture.
Cross-listed with: ARTH484.
Credit Only Granted for: ARTH484, CINE426 or FILM426.
Formerly: FILM426.

CINE429 Special Topics in National/International Cinemas (3 Credits)
Courses in National/International Cinemas may examine one or more national cinematic traditions (including Hollywood cinema), or may look across traditions comparatively, for example at international and/or transnational phenomena. Content varies.
Repeatable to: 6 credits.
Formerly: FILM429.

CINE429Q Ideology of Stereotyping: American and Middle Eastern Film and Television (3 Credits)
Exploration of cultural stereotyping, using examples from American and Middle Eastern cinema and television. Students will examine ideological constructs of Otherness and its history, including Orientalism; propaganda techniques; and audiovisual aspects of stereotyping. While the focus is on American and Middle Eastern cultural production, the course will engage broader issues of stereotyping in contemporary society and media. Readings include theories of propaganda and cultural ideology.
Cross-listed with: ARAB410.
Credit Only Granted for: ARAB410 or CINE429Q.

CINE430 Critical Issues in Israeli Cinema (3 Credits)
Critical investigation of Zionist and Israeli culture and politics through film.
Cross-listed with: HEBR430.
Credit Only Granted for: HEBR430, CINE430 or FILM430.
Formerly: FILM430.

CINE431 Italian Cinema II (In Translation) (3 Credits)
A study of Italian society and culture through the medium of film from the mid 1970's to the present. Taught in English.
Cross-listed with: ITAL473.
Credit Only Granted for: ITAL473, CINE431 or FILM431.
Formerly: FILM431.

CINE433 Holocaust in Italian Literature and Cinema (3 Credits)
Review of literature and theoretical writings of Italy's most famous survivor, Primo Levi, to a sampling of Italian films that focus in vastly different and often extremely controversial ways on the experience of the concentration camp, while addressing a series of central questions from the brutal realities of the camps to the "compromises" made in order to survive, the need to bear witness, and the idea of the survivor's guilt.
Cross-listed with: ITAL433.
Credit Only Granted for: CINE433, FILM433 or ITAL433.
Formerly: FILM433.

CINE441 Italian Cinema I: Neorealism (3 Credits)
Explores representations of Italy in cinema with special focus on identity formation and the movement of Italian neorealism and post neorealism. Taught in English.
Cross-listed with: ITAL436.
Credit Only Granted for: CINE441, FILM441 or ITAL436.
Formerly: FILM441.

CINE451 Film Noir and American Culture (3 Credits)
Introduction to a variety of American movies made in the 1940s and 1950s whose dark themes and stark black-and-white lighting led to their identification as film noir.
Prerequisite: ENGL245, FILM245, or CINE245; or permission of ARHU-College of Arts & Humanities.
Credit Only Granted for: CINE451 or FILM451.
Formerly: FILM451.

CINE452 The Origins of Cinema (3 Credits)
An in-depth engagement with the specificity of early cinema, dedicated to a comparative framework that compares the early cinema period (1890-1915) to other moments of media emergence, both before and after cinema, with special emphasis on the current, "digital" moment.
Prerequisite: ENGL245, FILM245, or FILM283; or permission of Film Studies Program.
Credit Only Granted for: CINE452 or ENGL468G.

CINE459 Special Topics in Genres/Auteurs/Cinema Movements (3 Credits)
Special topics in genres, auteurs, and cinema movements.
Repeatable to: 6 credits.
Formerly: FILM459.

CINE461 Political Cinema (3 Credits)
Histories of cinema and politics in the 20th century.
Prerequisite: ENGL245, FILM245, or CINE245; or permission of ARHU-School of Languages, Literatures, and Cultures department.
Cross-listed with: SLLC461.
Credit Only Granted for: CINE461, FILM461 or SLLC461.
Formerly: FILM461.

CINE462 Realism and the Real in Film (3 Credits)
Exploration of the problem of realism, one of the most central theoretical issues in film studies.
Prerequisite: ENGL245, FILM245, or CINE245; or permission of instructor.
Credit Only Granted for: CINE462 or FILM462.
Formerly: FILM462.

CINE463 Screening Time: History and Memory in Cinema (3 Credits)
An examination of the ways and techniques with which cinema produces a sense of time in the viewer.
Prerequisite: ENGL245, FILM245, or CINE245; or permission of ARHU-College of Arts & Humanities.
Cross-listed with: SLLC463.
Credit Only Granted for: SLLC463, CINE463 or FILM463.
Formerly: FILM463.

CINE464 The Violence of Cinema (3 Credits)
An investigation of cinema's multifaceted relationship to violence.
Prerequisite: ENGL245, FILM245, or CINE245; or permission of instructor.
Credit Only Granted for: CINE464 or FILM 464.
Formerly: FILM464.

CINE467 Visions and Fictions from Spain (3 Credits)
Overview of Spanish cinema from the end of the 19th century through present day Spain. Exploration of the production of literary and cinematic texts in their social, historical, political, religious, and cultural contexts.
Prerequisite: One course from SPAN331, SPAN332, SPAN333, SPAN361, SPAN362 or SPAN363; or permission of instructor.
Recommended: SPAN333.
Cross-listed with: SPAN467.
Credit Only Granted for: CINE427, CINE467, FILM427, SPAN427, or SPAN467.
Formerly: FILM427, CINE427, and SPAN427.

CINE469 Special Topics in Film Theories II (3 Credits)
Special topics in film theories.
Repeatable to: 6 credits.
Formerly: FILM469.

CINE499 Directed Study in Cinema and Media Studies (1-3 Credits)
Readings and Research in Film Studies under faculty supervison.
Prerequisite: Permission of instructor.
Repeatable to: 9 credits if content differs.
Formerly: FILM499.

CINX - Cinema and Media Studies Education Abroad

CINX200 Blockbusters and Bestsellers: Italian Cinema and Literature of the 21st Century (3 Credits)
Examines some of the last three decade's most popular Italian films and novels, systematically exploring various genres such as comedy, drama, mystery, historical and epic. Explores key topics of Italian history, culture and society through an analysis of selected literary and cinematic works, with a focus on cinematic and narrative techniques as well as literary and cinematic genre criticism.
Additional Information: This course is offered as part of the Maryland-in-Perugia study abroad program. Students must apply for this program through Education Abroad: More information at https://globalmaryland.umd.edu/offices/education-abroad/program/11294. Education Abroad processes registrations for this course on behalf of students.

CINX201 Cosa Nostra: Cinema and History of the (Anti)Mafia (3 Credits)
Examines the "Cosa Nostra", or Sicilian Mafia through historical, social, and cultural perspectives. Explores the progression of the Sicilian Mafia from the Risorgimento to the present day, the myths and legends surrounding the group, and efforts by US and Italian law enforcement and collaborators to fight organized crime through analysis of important American and Italian films portraying mafia culture.
Additional Information: This course is offered as part of the Maryland-in-Perugia study abroad program. Students must apply for this program through Education Abroad: More information at https://globalmaryland.umd.edu/offices/education-abroad/program/11294. Education Abroad processes registrations for this course on behalf of students.

CINX202 Italian Cinema from Neorealism to Netflix (3 Credits)
Examines some of the most important Italian films from the post-World War II era to the present day, covering ideological and aesthetic rules of film art, and reviewing and expanding upon the most important elements of film technique as well as essential topics in the field of film theory and criticism. Explores the roots of Italian cinema, analyzes Neorealism and examines the most important directors and genres, considering recent small-screen productions from HBO/RAI television and Netflix.
Additional Information: This course is offered as part of the Maryland-in-Perugia study abroad program. Students must apply for this program through Education Abroad: More information at https://globalmaryland.umd.edu/offices/education-abroad/program/11294. Education Abroad processes registrations for this course on behalf of students.

CINX301 Glued to the Screen: TV Shows, Norms, and Culture (3 Credits)
Introduces the notion of TV as a cultural forum, a social regulator, and a social critique. Using examples from American, Scandinavian, and also British television, we will analyze how TV operates by working through social issues, and how TV shows mirror societal concerns and assumptions.
Additional Information: This course is offered as part of the Maryland-in-Stockholm study abroad program. Students must apply for this program through Education Abroad: More information at ter.ps/UMStockholm. Education Abroad processes registrations for this course on behalf of students.

CINX302 Spain In Cinema: Global and Local Perspectives (3 Credits)
This course examines both Spanish cinematography and foreign/transnational audiovisual productions related to Spanish culture. The transdisciplinary approach includes film studies, sociology, history, anthropology and art theory, while also applying cultural and cross-cultural studies and post-colonialist views.
Additional Information: This course is offered as part of the Maryland-in-Barcelona study abroad program. Students must apply for this program through Education Abroad: More information at ter.ps/UMBarcelona. Education Abroad processes registrations for this course on behalf of students.

CINX304 London on Film: Representing the City in British and American Films (3 Credits)
Introduces students to key aspects of British film history and culture through consideration of the significance and meaning of London within British film culture. Students will compare and contrast the representation of London by different filmmakers in different eras, examine the social, cultural, and industrial factors that influence the making and reception of films, explore the concepts of "space" and "place", and draw links between London's history and its representation in films.
Additional Information: This course is offered as part of the Arts & Humanities-in-London study abroad program. Students must apply for this program through Education Abroad: More information at https://globalmaryland.umd.edu/offices/education-abroad/program/11854. Education Abroad processes registrations for this course on behalf of students.

CINX305 Spanish Cinema (3 Credits)
One of the clearest representations of a country's culture, along with its art, society and customs, is cinema. This course explores how cinema represents key aspects of Spanish history, politics, lifestyle, and community through the analysis of film format, aesthetics, and historical influences, as well as the production of a short film.
Additional Information: This course is offered as part of the Maryland-in-Sevilla study abroad program. Students must apply for this program through Education Abroad: More information at https://globalmaryland.umd.edu/offices/education-abroad/program/10249. Education Abroad processes registrations for this course on behalf of students.

CINX310 Mafia, Murder, and Mystery: Crime in Italian and American Cinema (3 Credits)
Studies how mafia and organized crime are presented in Italian and American cinematic texts. The course will examine the different expressions of the crime film genre, which dates back to the beginnings of filmmaking, focusing on the technical, visual, and aesthetic aspects of crime films.
Cross-listed with: ENGX310.
Additional Information: This course is offered as part of the Maryland-in-Perugia study abroad program. Students must apply for this program through Education Abroad: More information at ter.ps/UMPerugia. Education Abroad processes registrations for this course on behalf of students.

CINX311 Japanese Film: History, Culture, and Fantasy (3 Credits)
Examines a range of Japanese films spanning the second half of the 20th century, and situates them within their social, cultural and industrial contexts. Key periods in Japanese History will be introduced and the purpose and effect of their representation in films considered. Focusing on samurai period dramas, the rich Japanese tradition of ghost stories, and the Japanese animated film, we will think about how cultural practices, values and ideologies are refracted, circulated, enforced, and critiqued.
Additional Information: This course is offered as part of the ARHU-in-London study abroad program. Students must apply for this program through Education Abroad: More information at ter.ps/ARHULondon. Education Abroad processes registrations for this course on behalf of students.

CINX316 Introduction to Filmmaking (3 Credits)
Explores the fundamentals of fiction filmmaking to students with little to no experience. Learn how to create film story ideas, plan a shoot, basic shooting techniques, as well as basic video editing. Explores topics including: understanding the formal foundations of cinematic storytelling, scene pre-visualization using blocking and shooting diagrams, the basic skills of shooting on location, as well as the basic techniques of film editing using a mixture of lectures and analysis workshops, as well as hands-on shooting and editing exercises.
Additional Information: This course is offered as part of the Maryland-in-Rome study abroad program. Students must apply for this program through Education Abroad: More information at ter.ps/UMRome. Education Abroad processes registrations for this course on behalf of students.

CINX324 Modern Frames: European Art and Cinema (3 Credits)
From the great auteurs in European filmmaking to the provocateurs of the contemporary art scene, this course examines artistic practices in European cinema and visual arts. What role do art house film and art movements play in 20th and 21st century Europe? How are aesthetics influenced by the changing political landscape? How are intellectuals and artists working during and after Socialism? When do visual arts go beyond consumerism? Complete a case study of subversive art in Vienna and post-communist Prague and meet with Danish, Austrian, and Czech film people to discuss film in the late-capitalist era.
Additional Information: This course is offered as part of the DIS Copenhagen study abroad program. Students must apply for this program through Education Abroad. Education Abroad processes registrations for this course on behalf of students.

CINX325 Italian Cinema, Past and Present (3 Credits)
Develops an appreciation of Italian cinema from its birth to the present focusing on movements, trends, relevant and recurring themes and visual features. Provides an understanding of the role played by cinema in Italian society and encourages looking at film as a universal language capable of crossing geographic boundaries. The relationship between Italian cinema and other film movements will also be studied.
Additional Information: This course is offered as part of the Maryland-in-Rome study abroad program. Students must apply for this program through Education Abroad: More information at ter.ps/UMRome. Education Abroad processes registrations for this course on behalf of students.

CLAS - Classics

CLAS169 Special Topics in Study Abroad I (1-6 Credits)
Special topics course taken as part of an approved study abroad program.
Repeatable to: 15 credits if content differs.

CLAS170 Ancient Myths and Modern Lives (3 Credits)
What are myths and why do we tell them? What powers do myths have? We will tackle these questions by looking at the enduring and fascinating myths from ancient Greece and Rome. In addition to studying how they shaped ancient societies, we will also look at their modern influence and reflect upon the power that myths still hold in our contemporary world. Taught in English.
Cross-listed with: RELS170.
Credit Only Granted for: CLAS170 or RELS170.
Additional Information: This course cannot be taken for language credit.

CLAS171 Classical Myths in Europe (1 Credit)
The role which Classical Myths have played in the arts, architecture and politics of a major European city. This will only be offered through the study abroad program.

CLAS180 Discovering the World of Ancient Greece (3 Credits)
An exploration of the cultural traits and developments of ancient Greek civilization and its forerunners, from the Bronze Age Mycenaeans and Minoans, through the rise of the classical Greek city-states, to the expansion of Greek cultural influence in the wake of the conquests of Alexander the Great. Drawing upon the evidence of the archaeological remains as well as ancient historical and literary documents, students gain a basic familiarity with the principal monuments and artifacts of classical Greek civilization, the various institutions and values that characterized the Greeks, and the significant historical events that transformed the culture over the course of antiquity.

CLAS190 Discovering the World of Ancient Rome (3 Credits)
An exploration of the cultural traits and developments of ancient Roman civilization from its roots in Etruscan culture, through the rise of the Roman Republic, to the expansion of Roman cultural influence in the ancient world and the emergence of the Roman Empire. Drawing upon the evidence of the archaeological remains as well as ancient historical and literary documents, students gain a basic familiarity with the principal monuments and artifacts of ancient Roman civilization, the various institutions and values that characterized the Romans, and the significant historical events that transformed the culture over the course of antiquity.
Cross-listed with: HIST219T.
Credit Only Granted for: CLAS190 or HIST219T.

CLAS269 Special Topics in Study Abroad II (1-6 Credits)
Special topics course taken as part of an approved study abroad program.
Repeatable to: 15 credits if content differs.

CLAS273 Making Sense of Death (3 Credits)
How do we make sense of death? Thinking about death can cause feelings of anxiety, stir up painful memories, or make us wish our loved ones could have lived longer. At the same time, we may think that death is not a bad thing, that we ought to joyously celebrate the lives of our beloved when they die, or even that the dead live on. This course investigates this mix of contrasting and sometimes contradictory attitudes and practices concerning death by looking at ancient Greek and Roman precedents. The ancient Mediterranean world, like ours, was a messy complex of different approaches and responses to the facts of death. By examining how ancient societies managed and constructed what death meant, we might be able to take a fresh look at our societies and our own relations to death. To aid our inquiry, we will use the field of death studies (or thanatology) to study death in Greek mythology, Roman religion, ancient philosophy, and ancient medicine.

CLAS274 What is Romance? (3 Credits)
What is romance? This course approaches the question by reading ancient Greek romance novels in tandem with works inspired by them from a range of times and places. We will attempt to identify which traits define romance in a society and how romance narratives change in translation and adaptation.

CLAS275 Why do we laugh? (3 Credits)
An introduction to the breadth and complexity of humor's role in society. Students will explore ancient Greek and Roman comedies side-by-side with contemporary sitcoms and movies, to learn the explanations that various disciplines have offered about why we laugh, and to understand the major impact humor has in how we see ourselves and our world.
Additional Information: All readings will be done in English translation.

CLAS276 Are We Rome? (3 Credits)
America, from its very origins as an independent nation, saw itself as the new Rome: its system of government is built on Roman precedents, its national buildings look as if they came from the Roman Forum, and its leisure activities take us to stadiums modeled on the Colosseum. America's relationship to Rome, however, raises its greatest anxiety: will America fall as Rome did? In 1776, the year of American independence, Edward Gibbon published his History of the Decline and Fall of the Roman Empire; America has been thinking about the trajectory of its history alongside Rome's from the very beginning.
Credit Only Granted for: CLAS276 or CLAS289A.
Formerly: CLAS289A.

CLAS277 How Do You Feel? (3 Credits)
Where do our emotions come from? Are they universal biological experiences, or are they shaped by the society in which we live, and therefore different from culture to culture? When do emotions serve the interests of those in power, and when do they resist dominant ideologies? These questions have fascinated scholars from a variety of fields, from linguistics to psychology to literary studies. This course posits that an analysis of artistic and cultural products can reveal important insights about these questions. We will thus read a variety of works of Greco-Roman literature with the above questions in mind, comparing these ancient texts to modern-day films, testing whether and how the portrayal of emotions has changed over time. Still, we will not neglect the discoveries from fields outside of literary studies: throughout the semester, we will periodically discuss relevant works of psychology, sociology, and more, interpreting the texts and films at hand through an interdisciplinary lens.

CLAS305 Archaeological Methods and Practice (3 Credits)
A team-taught, interdisciplinary course discussing theories, methods, and ethical issues in the practice of archaeology.
Prerequisite: ANTH240, ARTH200, CLAS180, or CLAS190.
Cross-listed with: ANTH305, ARTH305, JWST319Y.
Credit Only Granted for: ANTH305, ARTH305, CLAS305, or JWST319Y.

CLAS308 The Classics in Context (1-3 Credits)
A Study Abroad course which introduces students to the topography, archaeology and culture of the ancient Mediterranean world.
Prerequisite: Permission of ARHU-Classics department.
Repeatable to: 9 credits if content differs.

CLAS309 Special Topics in Classical Literature (3 Credits)
Readings in translation.
Repeatable to: 9 credits if content differs.

CLAS310 Ancient Greek and Roman Philosophy (3 Credits)
A study of the origins and development of philosophy in ancient Greece and Rome, focusing on Socrates, Plato, Aristotle, the Epicureans, and Stoics.
Prerequisite: Must have completed 6 credits in philosophy or classics.
Cross-listed with: PHIL310, PHPE308Y.
Credit Only Granted for: PHIL310, CLAS310, or PHPE308Y.

CLAS311 Inventing Ancient Greek Culture (3 Credits)
Who were the ancient Greeks, and were they the founders of Western civilization' The course examines the foundations of ancient Greece. Through an analysis of the historical, archaeological, and linguistic evidence, it sheds light on the so-called Black Athena Controversy, which raised doubts about the ancient Greek contribution to Western culture. The course also focuses on the impact of modern identity politics on scholarly discussions of antiquity and the ways in which the Culture Wars of the 1980s and 1990s have influenced analyses of the ancient Greek world.
Cross-listed with: HIST328D.
Credit Only Granted for: CLAS311 or HIST328D.

CLAS312 The Modernity of Athenian Democracy (3 Credits)
Examines the question of how Ancient Greek thought can be a tool for facing the challenges of the modern world. Topics such as political participation and engagement in politics, lawfulness and justice, freedom and autonomy, democracy and civic responsibility are found at the core of Ancient Greek thought. In addition to these topics, the course explores, through the teachings of ancient Greek philosophers, historians, and poets, the questions of virtue and happiness at a personal level and the pursuit of happiness at the societal level. Love and friendship are necessary virtues to shape a harmonious and prosperous polis. By studying selected excerpts from the primary sources of Ancient Greek literature in translation, the course defines the core values of democratic society from the viewpoint of the Greeks.

CLAS313 From the Stoa to Silicon Valley: Ancient and Modern Approaches to Stoic Philosophy (3 Credits)
Stoicism, ancient Rome's most popular philosophy, posited that virtue is the only human good and that individuals must detach themselves emotionally from the material world in order to live ethical lives. Principles of Stoic philosophy will be explored together with the wide array of artistic, political, and intellectual traditions that have drawn inspiration from it, from the Haitian revolutionary movement of the late 18th century, to the sexist "manosphere" of Reddit and Twitter, to modern cognitive-behavioral therapy.
Cross-listed with: PHIL313, PHPE313.
Credit Only Granted for: CLAS313, PHIL313, or PHPE313.

CLAS314 Ancient Greek & Roman Cultures in Italy (3 Credits)
A study abroad course examining ancient Greek and Roman society in Italy through direct contact with original cultural sites, monuments, and museum collections in the city of Rome and the Bay of Naples area, including Pompeii, Herculaneum, and Paestum. Topics of lectures and discussions include ancient history, archaeology, art, and architecture, as well as daily life in antiquity, urbanism, the illicit trade in antiquities, and the preservation of cultural heritage.
Credit Only Granted for: CLAS308G, CLAS314, or ARTH369D.
Formerly: CLAS308G.

CLAS315 Greek and Roman Athletics (3 Credits)
The origin and evolution of athletics in ancient Greece and Rome studied as recreation, as play, as education, as a profession and as mass entertainment.
Cross-listed with: HIST339G.
Credit Only Granted for: CLAS315 or HIST339G.

CLAS316 Classical Antiquity and the Cinema (3 Credits)
Many films, while rooted in the time and place in which they were created, draw upon themes and stories from ancient Greek and Roman literature. While the filmmakers' understandings of modern social forces affect their representations of the ancient world, the ancient works also shape the ways in which filmmakers tell their stories. Film criticism and close reading complement each other in the analysis of films and the ancient works on which they are based.
Cross-listed with: CINE316.
Credit Only Granted for: CLAS316 or CINE316.

CLAS317 Ancient Medicine and Modern Medical Terms (3 Credits)
Students are introduced to the linguistic roots of medical terminology through a systematic explanation of their Greek and Latin components. At the same time, they learn the intellectual roots of Western medicine by studying selected aspects of medical thought and practice in the Greek and Roman worlds, including the ideas of Hippocrates and Galen, two giants of ancient medicine. Ancient theories of body systems are introduced and compared to modern medical knowledge.

CLAS320 Women in Classical Antiquity (3 Credits)
A study of women's image and reality in ancient Greek and Roman societies through an examination of literary, linguistic, historical, legal, and artistic evidence; special emphasis in women's role in the family, views of female sexuality, and the place of women in creative art. Readings in primary sources in translation and modern critical writings.
Cross-listed with: HIST328W, WGSS320.
Credit Only Granted for: CLAS320, WMST320, WGSS320 or HIST328W.

CLAS321 Science & Society in Ancient Greece & Rome (3 Credits)
How did ancient Greek and Roman scientific practices differ from and resemble our own? How do we as historians recognize when someone is conducting scientific inquiry? What were the social and cultural contexts of scientific production in the ancient world? With a focus on the scientific practices and products of ancient Greeks and Romans from around the fifth century BCE to the second century CE, we investigate how several scientific disciplines -- including medicine, astronomy, and biology --developed under the influence of ancient social and cultural contexts, and how ancient literatures, in turn, were shaped by those working in scientific fields of inquiry. In addressing these questions special attention will be paid to the methods employed by the available sources of ancient scientists and the modes of demonstration, argumentation, and rhetoric employed in scientific texts. Readings of primary materials will be supplemented with selections of secondary scholarship.

CLAS322 Roman Freedpersons (3 Credits)
The literary remains of three Roman freedpersons--the editor and biographer Tiro (c. 80-4 BCE), the poet and fabulist Phaedrus (fl. 1st cen. CE), and the philosopher Epictetus (c. 55-135 CE)--give us a rare glimpse into the internal experience of persons enslaved and emancipated by Roman elites. To contextualize these experiences, we study the legal basis of Roman slavery, epigraphic self-representations, and stereotyping representations of freedpersons by free authors. We also read our authors against comparable works by freeborn analogues--the senator Cicero, the poet Horace, and the philosopher Seneca--to test the boundaries of how the identity of libertus ("freedman") affected and failed to affect our authors' literary aims. To deepen our study of how historical conditions shape the creation of freed authorship and the transmission of freed authors, we also read, and consider the conditions surrounding the publication of, American freedpersons' literature.

CLAS330 Ancient Greek Religion: Gods, Myths, Temples (3 Credits)
Survey of Greek religious ideas and practices as they evolve from the Bronze Age to the early Christian period.
Cross-listed with: RELS370.
Credit Only Granted for: CLAS330 or RELS370.

CLAS331 Roman Religion: From Jupiter to Jesus (3 Credits)
Survey of the major institutions of Roman state and private religion and of the diverse religions, including Judaism and Christianity, practiced in the Roman empire.

CLAS340 Ancient Slavery and its American Impacts (3 Credits)
Interrogates how slavery permeated the ancient Mediterranean societies of Greece and Rome. We will pay particular attention to how hierarchical inequalities are institutionalized, experienced, and represented and to how different marginalized and dominant groups interacted. Enslaved persons performed necessary labor in Greece and Rome and their work was essential for the formation of ancient society in agriculture, mining, domestic spaces, literature, finance, and government. Studying ancient slavery offers a chance to examine Greece and Rome from the bottom up, parsing the scant literary and material evidence for the lives and struggles of enslaved persons. We will practice several different approaches in order to tease out the systematic, economic, political, and personal effects of slavery in the ancient world. The United States of America was also founded as a slave society, and discussions of slavery in the Americas often look back to the ancient Mediterranean. The course will therefore conclude with a unit on how enslavers and abolitionists in the United States utilized and responded to slavery in antiquity.
Cross-listed with: HIST339J.
Credit Only Granted for: CLAS340 or HIST339J.

CLAS369 Special Topics in Study Abroad III (1-6 Credits)
Special topics course taken as part of an approved study abroad program.
Repeatable to: 15 credits if content differs.

CLAS369A Ancient Greece and the Athletic Spirit (3 Credits)
From the time of the poems of Homer to the end of the Roman Empire, exercise of the body and physical competition played an essential role in ancient Greece. Athletics was regarded as both a sphere of excellence and a form of exciting entertainment. Students will travel around Greece and study firsthand the sites, monuments, and objects that defined the ancient experience of athletics, with the aim of understanding its principal forms, the spirit and values that guided it, and its interrelationship with other aspects of society and culture.

CLAS374 Greek Tragedy in Translation (3 Credits)
Study and analysis of the tragedies of Aeschylus, Sophocles and Euripides with special attention to the concepts of character and of thought as conceived by Aristotle in The Poetics.

CLAS375 Ancient Comedy (3 Credits)
Representative plays by Aristophanes, Menander, Plautus and Terence in translation; examination of Greek tradition in Roman and postclassical periods.

CLAS380 Archaeological Fieldwork in Greece (4 Credits)
Students will learn about the archaeology, history and culture of Greece by participating in the archaeological investigations at Kenchreai, the eastern port of ancient Corinth. Students will learn about data analysis, artifact processing, and conservation, all important components in archaeological fieldwork. This program also gives students a rare chance to live and to learn in one of the most archaeologically rich, historically important, and naturally beautiful regions in Greece, the northeastern Peloponnese. Students will visit sites and museums throughout this region, attend seminars, and experience life in a small village. In this way they will learn not only about the practice of archaeological field research, but also about Greek history and culture from ancient to modern times. While the course focuses on southern Greece during the Roman Empire and Late Antiquity, a period of prosperity and diversity at Kenchreai and in its broader area, students will also explore cultural and historical developments that influenced other regions and longer periods, from the Bronze Age to the Modern era, including religion and cult-practice, art and iconography, settlement and the environment, and the construction of identity.
Credit Only Granted for: CLAS369K or CLAS380.
Formerly: CLAS369K.

CLAS386 Experiential Learning (3-6 Credits)
Prerequisite: Must have a Learning Proposal approved by the Office of Experiential Learning Programs, faculty sponsor, and student's internship sponsor.
Restriction: Junior standing or higher.

CLAS409 Classics Capstone Seminar (3 Credits)
Comparative study of selected central aspects of both ancient Greek and Roman cultures as viewed from the standpoints of literary study, history, art history, and other fields as appropriate. Seminar format involving intensive student research.
Restriction: Permission of ARHU-Classics department.
Repeatable to: 6 credits if content differs.

CLAS419 The Classical Tradition (3 Credits)
Examination of the role of Greek and Roman civilization in shaping the arts and ideas of western culture.
Repeatable to: 9 credits if content differs.
Credit Only Granted for: CLAS419 or CLAS420.
Formerly: CLAS420.

CLAS470 Approaches to Greek Mythology (3 Credits)
Ancient and modern approaches to understanding Greek myth as expression of human experience, including interpretations drawn from psychology, anthropology, and comparative mythology.
Prerequisite: CLAS170; or permission of ARHU-Classics department.

CLAS488 Independent Study in Classical Civilization (3 Credits)
Prerequisite: Permission of ARHU-Classics department.
Repeatable to: 6 credits if content differs.

CLAS499 Independent Study in Classical Languages and Literatures (1-3 Credits)
Prerequisite: Permission of ARHU-Classics department.

CLAX - Classics Education Abroad

CLAX101 Ancient Rome: Civilization and Legacy (3 Credits)
Introduces students to the history and culture of the Roman world, from the Rome's beginnings in myth and legend through its rise to domination of the Mediterranean world, its violent conversion from a Republic to an Empire, and the long success of that Empire down to its collapse in the fifth century A.D. Course readings are supplemented by slides, videos and an overnight field trip to Rome.

CLAX102 Greek and Roman Mythology (3 Credits)
Explores mythology by studying the origins and history of a people, their deities, ancestors and heroes. The stories of the gods and legendary heroes of the Greco-Roman tradition have provided the fountainhead for literature and the arts in the service of religious and political imagery down to the present. Explores literature, with extensive readings of such writers as Homer and Vergil (noting, in passing, the influence upon later literature), and the visual depiction of these myths will also be studied.
Credit Only Granted for: CLAS170 or CLAX102.
Additional Information: This course is offered as part of the Maryland-in-Rome study abroad program. Students must apply for this program through Education Abroad: More information at ter.ps/UMRome. Education Abroad processes registrations for this course on behalf of students.

CLAX192 Life and Leisure in Ancient Rome (3 Credits)
Presents a survey of the social and cultural history of Ancient Rome. Seeks to answer such questions as how the Romans organized their day, what they ate and wore, the nature of family life, education, religion, and entertainment. Introduces the methodology of ancient history and the critical analysis of a wide variety of historical source materials, including inscriptions, as well as the interpretation of classical texts. Archeological evidence, including art and architecture, will also be examined. Field trips to historical sites and museums in Rome and at Ostia Antica will be used to reanimate ancient Roman history.
Additional Information: This course is offered as part of the Maryland-in-Rome study abroad program. Students must apply for this program through Education Abroad: More information at ter.ps/UMRome. Education Abroad processes registrations for this course on behalf of students.

CMLT - Comparative Literature

CMLT235 Black Diaspora Literature and Culture (3 Credits)
Examination of key works by writers of the African Diaspora. Relationship among black people across multiple geographic spaces; Africa, the Caribbean, the United States, Europe, Latin America, and Asia. Specific historical, cultural, and literary contexts; themes such as gender, sexuality, migration, slavery, freedom, and equality. Readings may include literary texts (fiction, poetry, drama), music and film. All readings in English, but drawn from multiple languages of the black diaspora, including English, Spanish, French and Portuguese.

CMLT242 Diversify and Multiply: Jewish Culture and the Production of an Identity (3 Credits)
Provides students with a unique exploration of cultural products produced by a diverse array of Jewish creators of literature, comedy and film. The texts, films, and performing arts touch on the central social, economic, and cultural issues of Jews during the ages, and up to the 21st century. This course will explore Jewish creativity throughout history, as well as the Jewish encounter with modernity as a whole. We will be diving into prominent creators such as Tiffany Haddish, Larry David, Sholem Aleichem, Adam Sandler, S. Y. Abramovitsch, Judd Apatow, Philip Roth, Amy Schumer, I. B. Singer, Ben Stiller, Franz Kafka, Dan Levy, and others. Examining their creations will open a window to the diverse methods of construction of modern Jewish identities.
Cross-listed with: JWST272.
Credit Only Granted for: JWST272, CMLT242, or ISRL249G.

CMLT269 Special Topics in Study Abroad II (1-6 Credits)
Special topics course taken as part of an approved study abroad program.
Repeatable to: 15 credits if content differs.

CMLT270 Global Literature and Social Change (3 Credits)
Comparative study of literature through selected literary works from several non-Western cultures, viewed cross-culturally in light of particular social, political, and economic perspectives.

CMLT275 World Literature by Women (3 Credits)
Comparative study of selected works by women writers of several countries, exploring points of intersection and divergence in women's literary representations.
Cross-listed with: WGSS275.
Credit Only Granted for: WMST275, CMLT275 or WGSS275.
Formerly: WMST275.

CMLT277 Literatures of the Americas (3 Credits)
Comparative study of several North, South, and Central American cultures with a focus on the specificities, similarities, and divergences of their literary and cultural texts.

CMLT280 Film Art in a Global Society (3 Credits)
Comparative study of a variety of film traditions from around the world, including cinema from Hollywood, Europe, Asia and developing countries, with a stress on different cultural contexts for film-making and viewing.
Cross-listed with: CINE280.
Credit Only Granted for: CINE280, FILM298D or CMLT280.
Formerly: FILM298D.

CMLT298 Topics in Comparative Studies (3-6 Credits)
Repeatable to: 9 credits if content differs.

CMLT369 Special Topics in Study Abroad III (1-6 Credits)
Special topics course taken as part of an approved study abroad program.
Repeatable to: 15 credits if content differs.

CMLT386 Experiential Learning (3-6 Credits)
Restriction: Junior standing or higher; and permission of ARHU-English department.

CMLT398 Special Topics in Comparative Studies (3 Credits)
Special topics in comparitive studies.
Repeatable to: 9 credits if content differs.

CMLT399E Literature in the Climate Crisis (3 Credits)
An investigation of the relationship between climate and art & literature. Introduction to ecological thinking followed by study of artistic and literary works thematically grouped by the four elements: Earth, Water, Air, and Fire. Readings from the German literary tradition (Goethe, Tieck, Stifter, Kafka, Frisch, Wolf) and contemporary research in the environmental humanities, with additional readings and viewings from elsewhere on the planet. Taught in English.
Recommended: 200-level General Education and/or humanities course; and sophomore standing.
Cross-listed with: GERS367.
Credit Only Granted for: GERM399E, CMLT399E, or GERS367.
Formerly: GERM399E.
Additional Information: Priority in enrollment will be given to German majors.

CMLT488 Genres (3 Credits)
A study of a recognized literary form, such as tragedy, film, satire, literary criticism, comedy, tragicomedy, etc.
Repeatable to: 6 credits if content differs.

CMLT498 Selected Topics in Comparative Studies (3 Credits)

CMLX - Comparative Literature Education Abroad

CMLX300 Leonardo da Vinci: Renaissance Man and Modern Myth (3 Credits)
Leonardo da Vinci (1452-1519) is the last great figure of Western history that masterfully fills the role of both artist and scientist. In light of this achievement, the course will discuss the artistic and scientific endeavors of Leonardo and the impact he had on the shaping of modernity.
Additional Information: This course is offered as part of the Maryland-in-Perugia study abroad program. Students must apply for this program through Education Abroad: More information at ter.ps/UMPerugia. Education Abroad processes registrations for this course on behalf of students.

CMLX400 Catalan Culture: Art, Literature and Soccer (3 Credits)
Offers a general introduction to modern and contemporary Catalan culture from the beginning of the twentieth to the twenty-first century. Topics covered include: nationalism, the politics of language, the avant-garde art of Salvador Dali and Miro, literature, and football (soccer).
Additional Information: This course is offered as part of the Arts & Humanities-in-London study abroad program. Students must apply for this program through Education Abroad: More information at https://globalmaryland.umd.edu/offices/education-abroad/program/11854. Education Abroad processes registrations for this course on behalf of students.

CMNS - Computer, Math, and Natural Sciences

CMNS100 Becoming a Science Terp (1 Credit)
Introduces students to the College of Computer, Mathematical, and Natural Sciences (CMNS) and the University. In a small classroom setting taught by CMNS faculty/staff, students will explore their college transition with a focus on: academic success skills, navigating college and campus resources, diversity, identity and inclusion, and career exploration. Each section of the course will have a CMNS Peer Mentor teaching assistant.
Restriction: Primary major must be in the College of Computer, Mathematical and Natural Sciences (CMNS); and must be first semester CMNS freshman student .
Credit Only Granted for: UNIV100 or CMNS100.

CMNS210 Peer Mentoring Fundamentals (2 Credits)
A foundational course for newly hired CMNS Peer Mentors. The course introduces mentors to all components of their new student leadership role and provides hands-on training. As part of this course, CMNS Peer Mentors will learn and be assessed on CMNS academic policies, CMNS100: Becoming a Science Terp teaching assistant responsibilities, CMNS major curricula and four-year sample plans, graduation planning, and the training required to provide front desk support in the CMNS Office of Student Services.
Restriction: Must have permission of the College of Computer, Mathematical, and Natural Sciences.
Credit Only Granted for: CMNS208A or CMNS210.
Formerly: CMNS208A.
Additional Information: This course is restricted to students who are selected and hired for the CMNS Peer Mentoring position.

CMNS211 Student Leadership and Development for Peer Mentors (3 Credits)
Prepares CMNS Peer Mentors to succeed in their roles within the CMNS Office of Student Services by developing core leadership and professional skills. Through interactive sessions and hands-on training, students will explore mentorship strategies, leadership, communication, equity, and student support. This course empowers peer mentors to lead with confidence while gaining valuable experience for academic and professional growth.
Prerequisite: CMNS210.
Restriction: Must be a CMNS peer mentor.
Credit Only Granted for: EDUC388U or CMNS211.

CMSC - Computer Science

CMSC100 Bits and Bytes of Computer and Information Sciences (1 Credit)
Students are introduced to the fields (and disciplines) of computer science and information science within a small classroom setting. They will learn to make a successful transition from high school to the university, while exploring study skills, student success plans and research opportunities.
Cross-listed with: INST101.
Restriction: For first time freshmen and first time transfer students; or permission of CMNS-Computer Science department.
Credit Only Granted for: CMSC100 or INST101.

CMSC106 Introduction to C Programming (4 Credits)
Design and analysis of programs in C. An introduction to computing using structured programming concepts. Intended for students with no or minimal programming experience.
Prerequisite: MATH115.
Restriction: Must not be in Computer Science program; and must not have completed any courses from CMSC131-499 course range.
Credit Only Granted for: CMSC106 or CMSC122.

CMSC115 Gender, Race and Computing (3 Credits)
Race and gender have shaped computing from its earliest histories to contemporary debates over bias in search algorithms, surveillance, and AI. As computational processes shape ever more dimensions of everyday life from the personal to the global scale, understanding how they operate and how power operates within them grows ever more important. Combating racism and sexism is not as simple as ensuring the pool of programmers and engineers is more diverse; structures of power are embedded in digital technologies as they are in all aspects of our society, and we must learn to perceive their operation if we hope to transform them. We will examine how racism and sexism operate in the field of computer science and in everyday uses of digital technologies, while studying how feminist and racial justice movements have created alternative approaches. This class is for anyone who wishes to better understand the relationships between digital technology, structural power, and social justice.
Cross-listed with: WGSS115.
Restriction: Must not have taken CMSC216 or higher.
Credit Only Granted for: WGSS115 or CMSC115.

CMSC122 Introduction to Computer Programming via the Web (3 Credits)
Introduction to computer programming in the context of developing full featured dynamic web sites. Uses a problem solving approach to teach basics of program design and implementation using JavaScript; relates these skills to creation of dynamic web sites; then explores both the potential and limits of web-based information sources for use in research. Intended to help relate a student's major to these emerging technologies.
Restriction: Must not have completed any courses from CMSC131-499 course range; and must not be concurrently enrolled in CMSC131.
Credit Only Granted for: CMSC106, or CMSC122.

CMSC125 Introduction to Computing (3 Credits)
Introduces you to the computing field as a whole. You will gain skills used across the spectrum of computing majors and learn about the great variety of routes into the various areas of study and employment in technological fields.
Prerequisite: Must have completed or be concurrently enrolled in MATH115 or higher.
Restriction: Must not be in the Computer Science program; and must not have completed any courses from CMSC131-499; and must not have completed BMGT302, IMDM127 or INST126.
Credit Only Granted for: IMDM127 or CMSC125.

CMSC131 Object-Oriented Programming I (4 Credits)
Introduction to programming and computer science. Emphasizes understanding and implementation of applications using object-oriented techniques. Develops skills such as program design and testing as well as implementation of programs using a graphical IDE. Programming done in Java.
Corequisite: MATH140.
Credit Only Granted for: CMSC131, CMSC133 or CMSC141.

CMSC132 Object-Oriented Programming II (4 Credits)
Introduction to use of computers to solve problems using software engineering principles. Design, build, test, and debug medium -size software systems and learn to use relevant tools. Use object-oriented methods to create effective and efficient problem solutions. Use and implement application programming interfaces (APIs). Programming done in Java.
Prerequisite: Minimum grade of C- in CMSC131; or must have earned a score of 5 on the A Java AP exam; or must have earned a satisfactory score on the departmental placement exam; and minimum grade of C- in MATH140.
Credit Only Granted for: CMSC132 or CMSC142.

CMSC133 Object Oriented Programming I Beyond Fundamentals (2 Credits)
An introduction to computer science and object-oriented programming for students with prior Java programming knowledge (conditionals, loops, methods). Program design, implementation, and testing using object-oriented techniques. All programming will be done in Java using a graphical IDE.
Prerequisite: Must have completed or be concurrently enrolled in MATH140.
Restriction: Permission of CMNS-Computer Science department; and student must have earned a 4 on the AP Computer Science A exam or a satisfactory score on the CMSC131 department placement exam.
Credit Only Granted for: CMSC131 or CMSC133.

CMSC198 Special Topics in Computer Science for Non-Majors (1-4 Credits)
A course designed to allow non-computer science majors and non-computer engineering majors to pursue a specialized topic or project.
Restriction: Must not be in Computer Science program.
Repeatable to: 6 credits if content differs.

CMSC216 Introduction to Computer Systems (4 Credits)
Introduction to the interaction between user programs and the operating system/hardware. Major topics include C programming, introductory systems programming, and assembly language. Other concepts covered include UNIX, machine data representation, thread management, optimization, and virtual memory. Programming is done in the Linux Environment.
Prerequisite: Minimum grade of C- in CMSC132; and minimum grade of C- in MATH141.
Restriction: Must be in a major within the CMNS-Computer Science department; or must be in Engineering: Computer program; or must be in the Computer Science Minor program; and Permission of CMSC - Computer Science department.

CMSC250 Discrete Structures (4 Credits)
Fundamental mathematical concepts related to computer science, including finite and infinite sets, relations, functions, and propositional logic. Introduction to other techniques, modeling and solving problems in computer science. Introduction to permutations, combinations, graphs, and trees with selected applications.
Prerequisite: Minimum grade of C- in CMSC131; and minimum grade of C- in MATH141.
Restriction: Must be in a major within the CMNS-Computer Science department; or must be in Engineering: Computer program; or must be in the Computer Science Minor program; and Permissions of CMSC - Computer Science department.

CMSC298 Special Topics in Computer Science (1-4 Credits)
A course designed to allow a lower level student to pursue a specialized topic or project.
Restriction: Permission of CMNS-Computer Science department.
Repeatable to: 6 credits if content differs.

CMSC298Q Quantum Steampunk Science-Fiction Workshop (3 Credits)
Steampunk is a science-fiction genre in which futuristic technologies populate Victorian-era settings. Recently, steampunk has come to life in the scientific field of quantum thermodynamics. Thermodynamics, the study of energy, grew out of the Industrial Revolution. Two centuries later, quantum physics is transforming computing and cryptography. Quantum science is now revolutionizing 19th-century thermodynamics in quantum thermodynamics, which features quantum engines, automata, and more. Quantum thermodynamics inspired the growing subgenre of quantum steampunk. In this course, you will read science fiction, write quantum steampunk short stories, receive feedback, and critique classmates' writing. In parallel, you will learn about quantum physics, technologies, and thermodynamics.
Cross-listed with: ARHU270, CHEM298Q, ENME299Q, PHYS299Q.
Credit Only Granted for: ARHU270, ARHU298Q, CHEM298Q, CMSC298Q, ENME299Q or PHYS299Q.

CMSC320 Introduction to Data Science (3 Credits)
An introduction to the data science pipeline, i.e., the end-to-end process of going from unstructured, messy data to knowledge and actionable insights. Provides a broad overview of several topics including statistical data analysis, basic data mining and machine learning algorithms, large-scale data management, cloud computing, and information visualization.
Prerequisite: Minimum grade of C- in CMSC216 and CMSC250.
Restriction: Permission of CMNS-Computer Science department.
Credit Only Granted for: CMSC320, DATA320 or STAT426.

CMSC330 Organization of Programming Languages (3 Credits)
A study of programming languages, including their syntax, semantics, and implementation. Several different models of languages are discussed, including dynamic, scripting (e.g., Ruby, Python) functional (e.g., OCaml, Haskell, Scheme), and memory safe systems programming (e.g., Rust). Explores language features such as formal syntax, scoping and binding of variables, higher-order programming, typing, and type polymorphism. Introduces finite automata, context free grammar, parsing, lambda calculus, and basics of security attacks and software security.
Prerequisite: Minimum grade of C- in CMSC250 and CMSC216.
Restriction: Must be in a major within the CMNS-Computer Science department; or must be in the Computer Science Minor program; or must be in Engineering: Computer program; and Permission of CMSC - Computer Science department.

CMSC335 Web Application Development with JavaScript (3 Credits)
Provides an introduction to modern ways of developing Web Applications/Services using JavaScript for both front-end and back-end. The course covers topics on fundamental JavaScript language constructs, server-side JavaScript, back-end data persistence, and client-side JavaScript to build Web Applications that interact with Web services and back-end databases.
Prerequisite: Minimum grade of C- in CMSC216 and CMSC250.
Restriction: Permission of CMNS-Computer Science Department.
Credit Only Granted for: CMSC389N or CMSC335.
Formerly: CMSC389N.

CMSC351 Algorithms (3 Credits)
A systematic study of the complexity of some elementary algorithms related to sorting, graphs and trees, and combinatorics. Algorithms are analyzed using mathematical techniques to solve recurrences and summations.
Prerequisite: Minimum grade of C- in CMSC250 and CMSC216.
Restriction: Must be in a major within the CMNS-Computer Science department; or must be in Engineering: Computer program; or must be in the Computer Science Minor program; and Permission from the CMSC - Computer Science department.

CMSC388 Special Topics in Computer Science (1-3 Credits)
Seminar courses that allow students to pursue new and emerging areas of Computer Science.
Restriction: Permission of CMNS-Computer Science department.
Repeatable to: 6 credits if content differs.

CMSC389 Special Topics in Computer Science (1-3 Credits)
Seminar courses that allow students to pursue new and emerging areas of Computer Science; course may be used as electives for the undergraduate degree and minor.
Repeatable to: 6 credits if content differs.

CMSC395 Teaching Techniques for Computer Science (1 Credit)
This course will assure that teaching assistants become better skilled at applying effective teaching practices that improve the classroom environment while learning methods to implement mechanisms to improve diversity and inclusion. Legal and ethical aspects of the role will also be considered. Students in the class will be currently working as a teaching assistant and, therefore, be able to apply what they are learning immediately in their own context.
Restriction: Students must be hired as a teaching assistant in the Computer Science Department for the semester they are registered for the course; and permission of the Computer Science Department.

CMSC396 Computer Science Honors Seminar (1 Credit)
Overview of computer science research activities, techniques, and tools. Diverse research areas will be covered, including systems, networks, artificial intelligence, human-computer interaction, software engineering, graphics, vision, and theory.
Prerequisite: Must have admission into Computer Science Departmental Honors Program.
Restriction: Permission of CMNS-Computer Science department.

CMSC398 Special Topics in Computer Science (1-3 Credits)
Seminar courses that allow students to pursue new and emerging areas of Computer Science.
Restriction: Permission of CMNS-Computer Science Department.
Repeatable to: 6 credits if content differs.

CMSC401 Algorithms for Geospatial Computing (3 Credits)
An introduction to fundamental geospatial objects and geometric algorithms for spatio-temporal data processing and analysis. Point data representation and analysis: spatial data models and data structures, algorithms for spatial queries, point clustering algorithms. Surface and scalar field modeling, such as terrains: raster and triangle-based models (TINs), algorithms for building and querying TINs. Algorithms for natural and urban terrain analysis: morphology computation and visibility analysis. Applications to processing and analysis of LiDAR (Light Detection And Ranging) data in the context of terrain reconstruction, urban modeling, forest management and bathymetry reconstruction for coastal data management. Road network computation and analysis: algorithms for route computation in road networks, and for road network reconstruction from GPS and satellite data.
Prerequisite: GEOG276; or a minimum grade of C- in CMSC330 and CMSC351; or permission of instructor.
Cross-listed with: GEOG470.
Jointly offered with: GEOG770.
Credit Only Granted for: CMSC498Q, CMSC401, CMSC788I, GEOG470, GEOG498I, GEOG770, or GEOG788I.
Formerly: GEOG498I.

CMSC411 Computer Systems Architecture (3 Credits)
Input/output processors and techniques. Intra-system communication, buses, caches. Addressing and memory hierarchies. Microprogramming, parallelism, and pipelining.
Prerequisite: Minimum grade of C- in CMSC330; or must be in the (Computer Science (Doctoral), Computer Science (Master's)) program.
Restriction: Permission of CMNS-Computer Science department.
Credit Only Granted for: ENEE446 or CMSC411.

CMSC412 Operating Systems (4 Credits)
A hands-on introduction to operating systems, including topics in: multiprogramming, communication and synchronization, memory management, IO subsystems, and resource scheduling polices. The laboratory component consists of constructing a small kernel, including functions for device IO, multi-tasking, and memory management.
Prerequisite: Minimum grade of C- in CMSC330 and CMSC351; and 1 course with a minimum grade of C- from (CMSC414, CMSC417, CMSC420, CMSC430, CMSC433, CMSC435, ENEE440, ENEE457).
Restriction: Permission of CMNS-Computer Science department; or must be in one of the following programs (Computer Science (Master's); Computer Science (Doctoral)).
Credit Only Granted for: CMSC412 or ENEE447.

CMSC414 Computer and Network Security (3 Credits)
An introduction to the topic of security in the context of computer systems and networks. Identify, analyze, and solve network-related security problems in computer systems. Fundamentals of number theory, authentication, and encryption technologies, as well as the practical problems that have to be solved in order to make those technologies workable in a networked environment, particularly in the wide-area Internet environment.
Prerequisite: Minimum grade of C- in CMSC330 and CMSC351; or must be in the (Computer Science (Doctoral), Computer Science (Master's)) program.
Restriction: Permission of CMNS-Computer Science department.
Credit Only Granted for: CMSC414 or ENEE457.

CMSC416 Introduction to Parallel Computing (3 Credits)
Introduction to parallel computing. Topics include programming for shared memory and distributed memory parallel architectures, and fundamental issues in design, development, and performance analysis of parallel programs.
Prerequisite: Minimum grade of C- in CMSC330 and CMSC351; or permission of instructor.
Jointly offered with: CMSC616.
Restriction: Permission of CMNS-Computer Science department.
Credit Only Granted for: CMSC416, CMSC498X, CMSC616, or CMSC818X.
Formerly: CMSC498X.

CMSC417 Computer Networks (3 Credits)
Computer networks and architectures. The OSI model including discussion and examples of various network layers. A general introduction to existing network protocols. Communication protocol specification, analysis, and testing.
Prerequisite: Minimum grade of C- in CMSC351 and CMSC330; and permission of CMNS-Computer Science department. Or must be in the (Computer Science (Doctoral), Computer Science (Master's)) program.

CMSC420 Advanced Data Structures (3 Credits)
Description, properties, and storage allocation functions of data structures including balanced binary trees, B-Trees, hash tables, skiplists, tries, KD-Trees and Quadtrees. Algorithms for manipulating structures. Applications from areas such as String Processing, Computer Graphics, Information Retrieval, Computer Networks, Computer Vision, and Operating Systems.
Prerequisite: Minimum grade of C- in CMSC351 and CMSC330; and permission of CMNS-Computer Science department. Or must be in the (Computer Science (Doctoral), Computer Science (Master's)) program.

CMSC421 Introduction to Artificial Intelligence (3 Credits)
Introduces a range of ideas and methods in AI, varying semester to semester but chosen largely from: automated heuristic search, planning, games, knowledge representation, logical and statistical inference, learning, natural language processing, vision, robotics, cognitive modeling, and intelligent agents. Programming projects will help students obtain a hands-on feel for various topics.
Prerequisite: Minimum grade of C- in CMSC351 and CMSC330; and permission of CMNS-Computer Science department. Or must be in the (Computer Science (Doctoral), Computer Science (Master's)) program.

CMSC422 Introduction to Machine Learning (3 Credits)
Machine Learning studies representations and algorithms that allow machines to improve their performance on a task from experience. This is a broad overview of existing methods for machine learning and an introduction to adaptive systems in general. Emphasis is given to practical aspects of machine learning and data mining.
Prerequisite: Minimum grade of C- in CMSC320, CMSC330, and CMSC351; and 1 course with a minimum grade of C- from (MATH240, MATH341, MATH461, ENEE290); and permission of CMNS-Computer Science department.

CMSC423 Computational Genomics (3 Credits)
Computers have revolutionized modern biological research by enabling the management and analysis of the large amounts of data generated through high-throughput experiments. This course provides insight into some of the biological problems that can be addressed using computational methods and introduces the main data structures and algorithms used to solve problems related to biological sequences such as DNA, RNA, and proteins. Many of the techniques taught in this course are applicable beyond the bioinformatics domain, as they are relevant to and commonly used in other areas of computer science. No knowledge of biology is required for this course.
Prerequisite: Minimum grade of C- in CMSC351 and CMSC330; and permission of CMNS-Computer Science department.

CMSC424 Database Design (3 Credits)
Students are introduced to database systems and motivates the database approach as a mechanism for modeling the real world. An in-depth coverage of the relational model, logical database design, query languages, and other database concepts including query optimization, concurrency control; transaction management, and log based crash recovery. Distributed and Web database architectures are also discussed.
Prerequisite: Minimum grade of C- in CMSC351 and CMSC330; and permission of CMNS-Computer Science department. Or must be in the (Computer Science (Doctoral), Computer Science (Master's)) program.

CMSC425 Game Programming (3 Credits)
An introduction to the principles and practice of computer game programming and design. This includes an introduction to game hardware and systems, the principles of game design, object and terrain modeling, game physics, artificial intelligence for games, networking for games, rendering and animation, and aural rendering. Course topics are reinforced through the design and implementation of a working computer game.
Prerequisite: Minimum grade of C- in CMSC330 and CMSC351.
Restriction: Permission of CMNS-Computer Science department.

CMSC426 Computer Vision (3 Credits)
An introduction to basic concepts and techniques in computervision. This includes low-level operations such as image filtering and edge detection, 3D reconstruction of scenes using stereo and structure from motion, and object detection, recognition and classification.
Prerequisite: Minimum grade of C- in CMSC330 and CMSC351 and 1 course with a minimum grade of C- from (MATH240, MATH341, MATH461, ENEE290); or must be in the (Computer Science (Doctoral), Computer Science (Master's)) program; or permission of the instructor.
Restriction: Permission of CMNS-Computer Science department.

CMSC427 Computer Graphics (3 Credits)
An introduction to 3D computer graphics, focusing on the underlying building blocks and algorithms for applications such as 3D computer games, and augmented and virtual reality (AR/VR). Covers the basics of 3D image generation and 3D modeling, with an emphasis on interactive applications. Discusses the representation of 3D geometry, 3D transformations, projections, rasterization, basics of color spaces, texturing and lighting models, as well as programming of modern Graphics Processing Units (GPUs). Includes programming projects where students build their own 3D rendering engine step-by-step.
Prerequisite: Minimum grade of C- in CMSC330 and CMSC351; 1 course with a minimum grade of C- from (MATH240, MATH341, MATH461, ENEE290).
Restriction: Permission of CMNS-Computer Science department.

CMSC430 Introduction to Compilers (3 Credits)
Topics include lexical analysis, parsing, intermediate representations, program analysis, optimization, and code generation.
Prerequisite: Minimum grade of C- in CMSC330 and CMSC351; and permission of CMNS-Computer Science department. Or must be in the (Computer Science (Doctoral), Computer Science (Master's)) program.

CMSC433 Programming Language Technologies and Paradigms (3 Credits)
Programming language technologies (e.g., object-oriented programming), their implementations and use in software design and implementation.
Prerequisite: Minimum grade of C- in CMSC330; or must be in the (Computer Science (Doctoral), Computer Science (Master's)) program.
Restriction: Permission of CMNS-Computer Science department.

CMSC434 Introduction to Human-Computer Interaction (3 Credits)
Assess usability by quantitative and qualitative methods. Conduct task analyses, usability tests, expert reviews, and continuing assessments of working products by interviews, surveys, and logging. Apply design processes and guidelines to develop professional quality user interfaces. Build low-fidelity paper mockups, and a high-fidelity prototype using contemporary tools such as graphic editors and a graphical programming environment (eg: Visual Basic, Java).
Prerequisite: Minimum grade of C- in CMSC330 and CMSC351; and permission of CMNS-Computer Science department. Or must be in the (Computer Science (Doctoral), Computer Science (Master's)) program.

CMSC435 Software Engineering (3 Credits)
State-of-the-art techniques in software design and development. Laboratory experience in applying the techniques covered. Structured design, structured programming, top-down design and development, segmentation and modularization techniques, iterative enhancement, design and code inspection techniques, correctness, and chief-programmer teams. The development of a large software project.
Prerequisite: 1 course with a minimum grade of C- from (CMSC412, CMSC417, CMSC420, CMSC430, CMSC433, ENEE447); and permission of CMNS-Computer Science department.

CMSC436 Programming Handheld Systems (3 Credits)
Fundamental principles and concepts that underlie the programming of handheld systems, such as mobile phones, personal digital assistants, and tablet computers. Particular emphasis will be placed on concepts such as limited display size, power, memory and CPU speed; and new input modalities, where handheld systems differ substantially from non-handheld systems, and thus require special programming tools and approaches. Students will apply these concepts and principles in the context of an existing handset programming platform.
Prerequisite: Minimum grade of C- in CMSC330 and CMSC351; or must be in the (Computer Science (Doctoral), Computer Science (Master's)) program.
Restriction: Permission of CMNS-Computer Science department.

CMSC437 Introduction to Quantum Software Laboratory (3 Credits)
Introductory Programming/Software laboratory for quantum computing. Understand the existing programming tools for quantum computers and the characteristics of quantum hardware. Develop quantum application prototypes and tools to characterize and mitigate the limitations of quantum hardware.
Prerequisite: Minimum grade of C- in CMSC457 or PHYS467; and familiarity with basic programming, languages (e.g., Python).
Restriction: Permission of CMNS-Computer Science department.

CMSC451 Design and Analysis of Computer Algorithms (3 Credits)
Fundamental techniques for designing efficient computer algorithms, proving their correctness, and analyzing their complexity. General topics include graph algorithms, basic algorithm design paradigms (such as greedy algorithms, divide-and-conquer, and dynamic programming), network flows, NP-completeness, and other selected topics in algorithms.
Prerequisite: Minimum grade of C- in CMSC351; and permission of CMNS-Computer Science department. Or must be in the (Computer Science (Doctoral), Computer Science (Master's)) program.

CMSC452 Elementary Theory of Computation (3 Credits)
Techniques are developed to determine the difficulty of a problem relative to a model of computation. Topics include Finite Automata, P, NP, decidability, undecidability, and communication complexity.
Prerequisite: Minimum grade of C- in CMSC351; and permission of CMNS-Computer Science department. Or must be in the (Computer Science (Doctoral), Computer Science (Master's)) program.

CMSC454 Algorithms for Data Science (3 Credits)
Fundamental methods for processing a high volume of data. Methods include stream processing, locally sensitive hashing, web search methods, page rank computation, network and link analysis, dynamic graph algorithms as well as methods to handle high dimensional data/dimensionality reduction.
Prerequisite: Minimum grade of C- in CMSC330 and CMSC351.
Restriction: Permission of CMSC-Computer Science department.

CMSC456 Cryptography (3 Credits)
The theory, application, and implementation of mathematical techniques used to secure modern communications. Topics include symmetric and public-key encryption, message integrity, hash functions, block-cipher design and analysis, number theory, and digital signatures.
Prerequisite: (CMSC106, CMSC131, or ENEE150; or equivalent programming experience); and (2 courses from (CMSC330, CMSC351, ENEE324, or ENEE382); or any one of these courses and a 400-level MATH course, or two 400-level MATH courses); and Permission of CMNS-Mathematics department or permission of instructor.
Cross-listed with: MATH456, ENEE456.
Credit Only Granted for: MATH456, CMSC456 or ENEE456.

CMSC457 Introduction to Quantum Computing (3 Credits)
An introduction to the concept of a quantum computer, including algorithms that outperform classical computation and methods for performing quantum computation reliably in the presence of noise. As this is a multidisciplinary subject, the course will cover basic concepts in theoretical computer science and physics in addition to introducing core quantum computing topics. No previous background in quantum mechanics is required.
Prerequisite: 1 course with a minimum grade of C- from (ENEE290, MATH240, MATH341, MATH461, MATH243); and 1 course with a minimum grade of C- from (CMSC351, PHYS313).
Cross-listed with: PHYS457.
Credit Only Granted for: CMSC457 or PHYS457.
Additional Information: Only Physics students may use MATH243 to satisfy the Linear Algebra prerequisite for CMSC/PHYS457.

CMSC460 Computational Methods (3 Credits)
Basic computational methods for interpolation, least squares, approximation, numerical quadrature, numerical solution of polynomial and transcendental equations, systems of linear equations and initial value problems for ordinary differential equations. Emphasis on methods and their computational properties rather than their analytic aspects. Intended primarily for students in the physical and engineering sciences.
Prerequisite: 1 course with a minimum grade of C- from (MATH240, MATH341, MATH461, ENEE290, MATH243); and 1 course with a minimum grade of C- from (MATH241, MATH340); and 1 course with a minimum grade of C- from (CMSC106, CMSC131); and 1 course with a minimum grade of C- from (MATH246, MATH341, ENEE290, MATH243).
Cross-listed with: AMSC460.
Credit Only Granted for: AMSC460, AMSC466, CMSC460, or CMSC466.

CMSC466 Introduction to Numerical Analysis I (3 Credits)
Floating point computations, direct methods for linear systems, interpolation, solution of nonlinear equations.
Prerequisite: 1 course with a minimum grade of C- from (CMSC106, CMSC131); and minimum grade of C- in MATH410.
Cross-listed with: AMSC466.
Credit Only Granted for: AMSC460, CMSC460, AMSC466, or CMSC466.

CMSC470 Introduction to Natural Language Processing (3 Credits)
Introduction to fundamental techniques for automatically processing and generating natural language with computers. Machine learning techniques, models, and algorithms that enable computers to deal with the ambiguity and implicit structure of natural language. Application of these techniques in a series of assignments designed to address a core application such as question answering or machine translation.
Prerequisite: Minimum grade of C- in CMSC320, CMSC330, and CMSC351; and 1 course with a minimum grade of C- from (MATH240, MATH341, MATH461, ENEE290).
Restriction: Permission of CMNS-Computer Science department.

CMSC471 Introduction to Data Visualization (3 Credits)
Datasets are becoming increasingly large and complex, requiring intuitive ways to explore and interpret them quickly and efficiently. In this case, a picture is worth a thousand words: visualizations enable us to transform data into images that are easier to understand and reason about, compared to raw numbers and raw text. Visualizations are critical tools in externalizing and organizing our knowledge and insights, whether to explore collected datasets to improve our understanding of the physical world, to assess and debug analysis/experimental workflows, or to present new and interesting results to diverse audiences. In this course we will study techniques and algorithms for creating effective visualizations based on principles from graphic design, perceptual psychology, and cognitive science. Students will learn how to design and build interactive visualizations for the web, using the D3.js (Data-Driven Documents) framework.
Prerequisite: Minimum grade of C- in CMSC330 and CMSC351; and permission of CMNS-Computer Science Department.
Restriction: Permission of the CMNS-Computer Science Department.
Credit Only Granted for: CMSC471 or CMSC498O.
Formerly: CMSC498O.

CMSC472 Introduction to Deep Learning (3 Credits)
An introduction to deep learning, a machine learning technique, as well as its applications to a variety of domains. Provides a broad overview of deep learning concepts including neural networks, convolutional neural networks, recurrent neural networks, generative models, and deep reinforcement learning, and an intuitive introduction to basics of machine learning such as simple models, learning paradigms, optimization, overfitting, importance of data, and training caveats.
Prerequisite: Minimum grade of C- or higher in CMSC330 and CMSC351; and 1 course with a minimum grade of C- or higher from (MATH240, MATH341, MATH461, ENEE290).
Restriction: Permission of the CMNS-Computer Science department. Or must be in the (Computer Science (Doctoral), Computer Science (Master's) program.

CMSC473 Capstone in Machine Learning (3 Credits)
Semester-long project course in which each student will identify and carry out a project related to machine learning, with the goal of publishing a research paper or software tool.
Prerequisite: Minimum grade of C- or higher in CMSC421 or CMSC422.
Recommended: Background or exposure to machine learning topics is strongly encouraged.
Restriction: Permission of instructor and Permission of CMSC - Computer Science department.
Credit Only Granted for: CMSC498P or CMSC473.
Formerly: CMSC498P.
Additional Information: Students will be paired with project advisors from the UMD faculty or alternatively, an industry advisor. Students are encouraged to plan for projects results that can be published at academic conferences or will impact academic research.

CMSC474 Introduction to Computational Game Theory (3 Credits)
Game theory deals with interactions among agents (either human or computerized) whose objectives and preferences may differ from the objectives and preferences of the other agents. It will also provide a comprehensive introduction to game theory, concentrating on its computational aspects.
Prerequisite: Minimum grade of C- in CMSC351 and CMSC330; and permission of CMNS-Computer Science department. Or must be in the (Computer Science (Doctoral), Computer Science (Master's)) program.
Credit Only Granted for: CMSC474, ECON414, GVPT390 or GVPT399A.

CMSC475 Combinatorics and Graph Theory (3 Credits)
General enumeration methods, difference equations, generating functions. Elements of graph theory, matrix representations of graphs, applications of graph theory to transport networks, matching theory and graphical algorithms.
Prerequisite: 1 course with a minimum grade of C- from (MATH240, MATH341, MATH461, ENEE290, MATH243); and 1 course with a minimum grade of C- from (MATH241, MATH340); and 1 course with a minimum grade of C- from (MATH310, CMSC250).
Cross-listed with: MATH475.
Credit Only Granted for: MATH475 or CMSC475.

CMSC477 Robotics Perception and Planning (3 Credits)
A hands-on introduction to perception and planning for robotics, including rigid body transformations and rotations, dynamics and control of mobile robots/drones, graph based and sampling based planning algorithms, Bayseian and Kalman filtering, camera models and calibration, projective geometry, visual features, optical flow, pose estimation, RANSAC and Hough transform, structure from motion, visual odometry, machine learning basics, visual recognition and learning.
Prerequisite: 1 course from (MATH240, MATH341, MATH461, ENEE290); and (ENEE467 or CMSC420).
Restriction: Must be in the Robotics and Autonomous Systems minor; and permission of Computer Science department.
Additional Information: Students in the Robotics and Autonomous Systems minor should take ENEE467 as a prerequisite; Computer Science students not in the minor should take CMSC420.

CMSC488 Special Topics in Computer Science (1-3 Credits)
Seminar courses that allow students to pursue new and emerging areas of Computer Science.
Restriction: Permission of CMNS-Computer Science department.
Repeatable to: 6 credits if content differs.
Additional Information: Course may be used as electives for the undergraduate degree and minor.

CMSC498 Selected Topics in Computer Science (1-3 Credits)
An individualized course designed to allow a student or students to pursue a selected topic not taught as a part of the regular course offerings under the supervision of a Computer Science faculty member. In addition, courses dealing with topics of special interest and/or new emerging areas of computer science will be offered with this number. Selected topics courses will be structured very much like a regular course with homework, project and exams. Credit according to work completed
Restriction: Permission of CMNS-Computer Science department.

CMSC499 Independent Undergraduate Research (1-3 Credits)
Students are provided with an opportunity to participate in a computer science research project under the guidance of a faculty advisor. Format varies. Students and supervising faculty member will agree to a research plan which must be approved by the department. As part of each research plan, students should produce a final paper delineating their contribution to the field.
Restriction: Must be in one of the following programs (Computer Science; Engineering: Computer) ; and permission of CMNS-Computer Science department.

COMM - Communication

COMM107 Oral Communication: Principles and Practices (3 Credits)
A study of and practice in oral communication, including principles of interviewing, group discussion, listening, informative briefings, and persuasive speeches.
Credit Only Granted for: COMM107, COMM200, ENES143, INAG110, JOUR130 or THET285.

COMM130 Professional Communication and Writing (1 Credit)
Designed to enhance the clarity and grace of students' writing. Students will acquire knowledge of writing based on principles of style and grammar as well as argument and organizational structure across a diversity of professional writing contexts. Students will also engage in peer review of one another's writing.
Restriction: Must be in the Communication major.

COMM170 Foundations of Listening (3 Credits)
Role, process, and levels of listening behavior and the development of listening skills.

COMM200 Critical Thinking and Speaking (3 Credits)
Theory and practice of persuasive discourse analysis and composition. Research techniques, logical and rhetorical conceptions of argument, and technical principles for persuading in public venues.
Credit Only Granted for: COMM107, COMM200, ENES143, INAG110, JOUR130, OR THET285.

COMM201 Introduction to Public Relations (3 Credits)
Basic concepts and principles of public relations. Roles in organizations and society; history; skills and practices of public relations; theories and models of effective and ethical public relations.
Prerequisite: Must have completed or be concurrently enrolled in COMM130.
Restriction: Must be in the Communication major.

COMM207 Oral Communication for Engineers (1 Credit)
An exploration of oral communication skills which prepares engineers to engage in interpersonal communication in professional and international settings, communicate effectively in group environments, and deliver listenable presentations.
Prerequisite: ENES100.

COMM230 Argumentation and Debate (3 Credits)
A study of the fundamental principles of reasoning, analysis, and evidence preparation of debate briefs and presentation of standard academic debate.

COMM250 Introduction to Communication Inquiry (3 Credits)
An introduction to the field of communication. Definitions, models, and contexts of communication; rhetorical theory and rhetorical criticism of discourse.

COMM269 Special Topics in Study Abroad II (1-6 Credits)
Special topics course taken as part of an approved study abroad program.
Repeatable to: 15 credits if content differs.

COMM288 Communication Internship (1-6 Credits)
An individual experience arranged by the student with the instructor. Does not satisfy communication major requirements. 45 hours of supervised internship per credit hour with communication professional. Not a substitute for COMM386.
Prerequisite: Permission of ARHU-Communication department.
Repeatable to: 6 credits if content differs.

COMM296 Deliberative Democracy (3 Credits)
How do we change our politics, save democracy, and move beyond the "us vs. them" culture that divides us? This course begins with the premise that how we talk to one another and debate controversial issues can promote the public good or erode it in irreparable ways. Students in each class session will put principles of public dialogue into practice as they learn deliberative theories and skills that can help save democracy. Class readings will turn to historical case studies to frame the most controversial political issues we face today.
Credit Only Granted for: HNUH238A, COMM398I (Fall 2022), or COMM296.
Formerly: COMM398I.

COMM298 Selected Topics in Communication (3 Credits)
Special topical study of contemporary issues in communication.
Repeatable to: 6 credits if content differs.

COMM301 Rhetorical Theories (3 Credits)
Explores the idea of rhetoric, from antiquity to digitality. Rhetoric, as an art of moving bodies, is central to democratic self-governance: only through persuading each other can we develop a shared vision of a just and desirable future. This course tracks the genesis of rhetorical theory in the ancient world, 20th-century struggles against fascist rhetoric, and contemporary extensions of rhetoric in digital media ecologies.
Prerequisite: COMM130, COMM250; and one course from STAT100, BMGT230, EDMS451, CCJS200, PSYC200, or SOCY201; and one course from COMM107, COMM200, or COMM230; and must have completed or be concurrently enrolled in COMM304.
Restriction: Must be in the Communication major.
Credit Only Granted for: COMM301 or COMM401.
Formerly: COMM401.

COMM302 Communication Science Theories (3 Credits)
This class introduces students to the principles of theory construction and offers a critical overview of how communication theories can be applied to solving problems in diverse social contexts, including interpersonal, intercultural, organizational, health, and/or political issues. The ultimate goal of this course is to put students in an intellectual position to understand theories more logically and critically and use them appropriately and effectively in conducting academic research and addressing social issues.
Prerequisite: COMM130, COMM250; and one of STAT100, BMGT230, EDMS451, CCJS200, PSYC200, or SOCY201; and one of COMM107, COMM200, or COMM230; and must have completed or be concurrently enrolled in COMM304.
Restriction: Must be in the Communication major.
Credit Only Granted for: COMM302 or COMM402.
Formerly: COMM402.

COMM303 Media Theory (3 Credits)
Provides students with an introduction to media theory from multiple perspectives. We will begin by understanding how the history of mediated communication has been connected to ideology and lived experiences. Through readings, discussions, and activities, you will understand how technical, historical, economic social, and political forces have helped shape media content and the media themselves. You should also become familiar with the debate over how much influence the media have over their audiences, and what types of influences are present. The course will introduce issues relevant to consideration of media and historically underrepresented and marginalized groups, as well as individual and societal functions of the media.
Prerequisite: COMM130 and COMM250; and one of STAT100, BMGT230, EDMS451, CCJS200, PSYC200, or SOCY201; and one of COMM107, COMM200, or COMM230; and must have completed or be concurrently enrolled in COMM304.
Restriction: Must be in the Communication major.

COMM304 Communication Research Literacy (3 Credits)
Explores the different research traditions in the Communication discipline. This "literacy" course will develop students' ability to locate and fully comprehend Communication research and to understand how that research is conducted, reported, analyzed, and critiqued in Communication literature.
Prerequisite: Must have completed the Communication gateway requirements (COMM250; and one of STAT100, BMGT230, EDMS451, CCJS200, PSYC200, or SOCY201; and one of COMM107, COMM200 or COMM230). Must have completed or be concurrently enrolled in COMM130.
Restriction: Must be in the Communication program.

COMM305 Qualitative Communication Research Methods (3 Credits)
Introduces undergraduate students to the methods used in qualitative communication research. Topics covered in class include ethics, field research, reflexivity, data collection, and data analysis. Over the course of the semester, students will develop a research prospectus, engage in field research (interviews and observations), analyze qualitative data, and write/present their research.
Prerequisite: COMM130 and COMM304.
Restriction: Must be in the Communication major.

COMM306 Rhetorical Methods in Communication (3 Credits)
Equips students with skills for conducting research using rhetorical-critical methods. Such methods are crucial for scholars studying all kinds of public rhetoric: speeches, popular culture, photojournalism, digital media, public monuments, laws, and more. They are also instrumental for citizens engaging with elected officials, other citizens, and democratic institutions, as well as professionals who seek to create and understand persuasive discourse. This course will equip you with critical interpretive skills important to your work as a scholar, citizen, and professional.
Prerequisite: COMM130 and COMM304.
Restriction: Must be in the Communication major.

COMM307 Quantitative Methods in Communication (3 Credits)
Designed to introduce students to the basics of quantitative communication research methods. As such, it covers the basic principles of scientific inquiry, the process for generating research questions and hypotheses, the concept of variables, sampling methods, research designs, basics of data analyses, as well as ethics in scientific research. This course prepares students to become informed consumers of quantitative communication research.
Prerequisite: COMM130 and COMM304.
Restriction: Must be in the Communication major.
Credit Only Granted for: COMM400 or COMM307.
Formerly: COMM400.

COMM311 Peer Consulting in Oral Communication (3 Credits)
Provides training in the principles and practice of peer consulting in the context of the Oral Communication Center in the Department of Communication. Students will apply and integrate the knowledge and skills acquired in their fundamental studies oral communications course with new training to help their peers become outstanding listeners and speakers. Students will also engage in a group research project designed to extend knowledge in peer consulting best practices.
Restriction: Permission of Communication department.
Credit Only Granted for: COMM398C or COMM311.
Formerly: COMM398C.
Additional Information: There will be a pre-enrollment interview conducted before students are given permission to enroll in the course. Contact the instructor for details.

COMM312 Peer Mentoring in Oral Communication (3 Credits)
Provides training in the principles and practices of peer mentoring in the context of the Oral Communication Center in the Department of Communication. As peer mentors, students will apply and integrate the knowledge and skills acquired in COMM311 to help train and develop new peer consultants. Specifically, peer mentors will utilize communicative best practices, focusing on: the establishment of shared goals; performance reviews; project management and evaluation; and negotiating the mentor/mentee relationship.
Prerequisite: COMM311.
Restriction: Permission of Department of Communication.
Credit Only Granted for: COMM398U or COMM312.
Formerly: COMM398U.

COMM320 Strategic Communication (3 Credits)
Presents a system of strategies that underlie communication. It is a practice-based framework with definitions, conditions, risks, and rewards that inform the moves and motives of influence professionals. Using case studies, interactive discussions, industry insights, and practical exercises, students will develop the critical thinking, analytical, and ethical decision-making skills necessary to succeed in today's complex communication landscape.
Credit Only Granted for: COMM320 or COMM498J.
Formerly: COMM498J.

COMM324 Communication and Gender (3 Credits)
Explores how communication shapes constructions of gender, sex, sexuality and other identity markers. Topics include issues of oppression, identity, and power and social, political, and economic situations and examines how these issues impact our daily lives.

COMM330 Argumentation and Public Policy (3 Credits)
Contemporary theories of argumentation with special emphasis on methods of formulating and critiquing public policy argument.

COMM331 News Writing and Reporting for Public Relations (3 Credits)
Writing and researching news and information media for public relations; laboratory in news-gathering tools and writing techniques for public relations.
Prerequisite: COMM130 and COMM201.
Restriction: Must be in Communication program; and (sophomore standing; or junior standing).
Credit Only Granted for: JOUR201, COMM231, or COMM331.
Formerly: COMM231.

COMM340 Communicating the Narrative (3 Credits)
The role of narratives in communicating messages and development of strategies to effectively communicate the narrative form through storytelling, oral reading, and anecdotes.

COMM341 Environmental Communication (3 Credits)
Explores the theory and practice of talking about the environment. Students will explore how environmental discourses construct and challenge our identities and relationships with other beings as part of multiple complex and interconnected systems. Topics covered include historical and contemporary rhetorics of environmentalism, scholarly thought on discourses of nature and culture, and efforts to relocate the "center" of environmental communication by privileging the perspectives and strategies of marginalized knowledges, practices, and voices.
Credit Only Granted for: COMM398O or COMM341.
Formerly: COMM398O.

COMM345 Foundations of Public Dialogue and Deliberation (3 Credits)
Dialogue and deliberation, a form of relational communication, strengthens democracy in diverse, pluralistic communities. Students analyze case studies and practice relevant skills to support the productive exchange of arguments and work through civic issues.
Prerequisite: COMM107 or COMM200; and ENGL101.

COMM351 Public Relations Techniques (3 Credits)
The techniques of public relations, including news releases, publications and printed materials, audio-visual techniques, speeches and special events. Application of these techniques in laboratory and field projects.
Prerequisite: COMM331.
Restriction: Must be in Communication program.

COMM353 New Media Writing for Public Relations (3 Credits)
Students learn the uses and influence of new media on public relations practice and expand their ability to write using new and traditional media platforms and tools
Prerequisite: Minimum grade of C- in COMM351.
Restriction: Must be in Communication program.
Credit Only Granted for: COMM352 or COMM353.
Formerly: COMM352.

COMM354 Public Relations Programs (3 Credits)
Analysis of eight major programs typically carried out by public relations professionals: employee relations, media relations, financial relations, member relations, governmental relations, community relations, fundraising and dealing with activist public.
Prerequisite: COMM201.

COMM360 The Rhetoric of Black America (3 Credits)
An historical-critical survey of the rhetoric of Black Americans from the colonial period to the present.

COMM363 Developing Digital Media: Blogs, Magazines, and their Audiences (3 Credits)
Develop journalistic and digital media production skills while examining how communication theory and periodical methodology combine to create information-sharing communities among targeted audiences. Develop skills for positions in magazine publishing, organizational communication, journalism, marketing, public relations, social media, and advertising.
Prerequisite: COMM107 or COMM200, COMM130, and COMM250.
Restriction: Restricted to COMM majors.

COMM364 Communication, Sport, and Media (3 Credits)
Communication and culture are central to sport and sports media. From youth athletics to the professional level, sport is a multi-billion dollar industry. Indeed, sport is deeply embedded within American culture. In this course, we examine the connections amongst communication, culture, sport, and media. Specifically, we examine how communication, culture, sport, and media shape our understanding of cultural identities such as gender, race and ethnicity, sexual orientation, (dis)ability, and/or nationality, as well as issues of commodification, gaming, and more.
Credit Only Granted for: COMM449E or COMM364.
Formerly: COMM449E.

COMM365 Social Media & Digital Culture (3 Credits)
An examination of the relationship between social media, communication, culture, economics, and politics. Emphasizes critical analysis of social media texts, platforms, and technologies. Engages contemporary theories of digital media alongside practical lessons on social media production.

COMM369 Special Topics in Study Abroad III (1-6 Credits)
Special topics course taken as part of an approved study abroad program.
Repeatable to: 15 credits if content differs.

COMM370 Mediated Communication (3 Credits)
Analysis and critique of structure, performance, content, effects, and future of mediated communication.
Prerequisite: COMM250.
Restriction: Junior standing or higher.

COMM371 Communication and Digital Media (3 Credits)
A basic introduction to communication in the digital age. Through class lectures, assignments and projects, students will learn to effectively use new media for the purpose of strategic message creation and management used in the field of communication. Students will apply the basics of visual layout skills and the principles of visual design to create messages using words and images.
Restriction: Must be in Communication program.

COMM372 Communication, Meaning, and Digital Media (3 Credits)
An exploration of visual communication and meaning creation. A theoretical and practical application of communication concepts and techniques in the production of visual content.
Restriction: Must be in Communication program.

COMM373 Communication and Digital Visual Narrative (3 Credits)
Examination of the traditional style of visual communication, its practices and theoretical underpinnings juxtaposed against contemporary digital media aesthetics and techniques. Utilizing a variety of communication skills and new media tools, students will plan, write, shoot, edit, and upload digital visual narratives.
Restriction: Must be in Communication program.

COMM374 Communicating Visually: Message Production and Digital Media (3 Credits)
Focus on the interplay between technology, images and sound in the creation of digital content. This is a communication process by which a digital visual message evolves from conception to completion, incorporating the creative, financial and marketing tools. Students will conceive, plan, recruit and supervise digital video projects, developing a familiarity with production management technique and execution.
Restriction: Restricted to Communication Majors at the Universities at Shady Grove.

COMM375 Documentary Theory and Practice (3 Credits)
A historical and theoretical introduction to documentary films and videos. Students will explore the power of documentaries to address socially significant issues.
Restriction: Must be in Communication program.

COMM376 Communication through Advocacy Short Film (3 Credits)
Explores the theory and practice of contemporary communication and advocacy short form video.
Restriction: Must be in Communication program.

COMM377 Digital Media in London (3 Credits)
Provides students with skills in production practice while also incorporating theory and cultural studies. Students are challenged to understand societal problems around economy, race, gender, identity and power and to extend that exploration by building projects that utilize high demand skills in the digital communication and documentary professions. Students will write, record voice over, interview people, and build projects with compelling narrative structure. The projects will be an important component of their portfolio when applying to graduate school or their first professional efforts post-graduation. Classroom discussions will contain balance between practical instruction and critical discussion built around racial, social, and economic structures and systems.
Credit Only Granted for: COMM369D or COMM377.
Formerly: COMM369D.

COMM382 Essentials of Intercultural Communication (3 Credits)
Introduction of major theories and concepts of intercultural communication; examination of processes that make up cultural differences; and use of intercultural communication competence skills.
Credit Only Granted for: COMM382 or COMM482.

COMM385 Influence (3 Credits)
Explores contemporary theories of influence and their implications for communication practice. Topics include power and influence, logical theory, rhetorical theory, persuasion theory, framing theory, social influence theory, and propagation of influence in mediated social networks.
Credit Only Granted for: COMM385 or COMM498I (Spring 2014).
Formerly: COMM498I (Spring 2014).

COMM386 Experiential Learning (3-6 Credits)
Supervised internship experience with communication professionals. Relation of academic training to professional experience.
Prerequisite: Permission of ARHU-Communication department.
Restriction: Junior standing or higher; and must be in Communication program.

COMM388 Communication Practicum (1-3 Credits)
Supervised professional-level practice in communication.
Prerequisite: Permission of ARHU-Communication department.
Repeatable to: 3 credits if content differs.

COMM390 Health Communication (3 Credits)
Designed to introduce students to the academic and practical fields of health communication. It blends theoretical concepts and practical concerns that impact upon health communication processes. To be specific, this course extensively covers influential theories and models of behavior change as well as cutting-edge research on health communication interventions or campaigns, exposing students to authoritative work done in both areas. Students in this class will also learn about the process of planning a comprehensive health communication campaign and have the opportunity to work in groups to develop their own campaign plans addressing an urgent health problem.
Credit Only Granted for: COMM390 or COMM398E.
Formerly: COMM398E.

COMM398 Selected Topics in Communication (3 Credits)
Topical study of contemporary issues in communication.
Repeatable to: 12 credits if content differs.

COMM399 Honors Thesis (3 Credits)
Prerequisite: Permission of ARHU-Communication department.
Restriction: Must be in Communication program.
Repeatable to: 6 credits if content differs.

COMM400 Research Methods in Communication (3 Credits)
Philosophy of scientific method; role of theory; research ethics; empirical research methods (measurement, sampling, design, analysis).
Prerequisite: COMM250; and must have an introductory course in statistics.
Restriction: Must be in Communication program.
Credit Only Granted for: COMM400 or COMM307.

COMM401 Interpreting Strategic Discourse (3 Credits)
Principles and approaches for practical analysis of discourse designed to shape audience opinion.
Prerequisite: COMM250.
Restriction: Must be in Communication program.

COMM402 Communication Theory and Process (3 Credits)
Philosophical and conceptual analysis of communication theories.
Prerequisite: COMM250.
Restriction: Must be in Communication program.

COMM406 English Writing in Professional Communication Contexts (3 Credits)
Enhance skills in writing for a diversity of professional communication contexts, including business, health, law, and education.

COMM407 Advanced Public Speaking (3 Credits)
Enhance skills in public speaking for a diversity of professional communication contexts, including business, health, law, and education.
Prerequisite: COMM107 or COMM200; or any course that counts for the General Education Fundamental Studies Oral Communication requirement.

COMM419 Special Topics in Health Communication (3 Credits)
Covers a variety of topics of health communication. Blends theoretical concepts and practical concerns that impact upon health communication processes. This course covers a specific topic of health communication in greater depth and applies scholarly discoveries to real-world examples.
Prerequisite: COMM304.
Restriction: Must be in the Communication Major.
Repeatable to: 12 credits if content differs.

COMM420 Theories of Group Discussion (3 Credits)
Current theory, research and techniques regarding small group process, group dynamics, leadership and decision-making.

COMM421 Communicating Leadership (3 Credits)
Examines the nature of leadership, theories of leadership from a communication perspective, relationships between leadership, authority, power, and ethics. Explores leadership responsibilities, commitments, and actions.

COMM422 Communication Management (3 Credits)
Communication policies, plans, channels, and practices in the management of the communication function in organizations.

COMM423 Communication Processes in Conferences (3 Credits)
Group participation in conferences, methods of problem solving, semantic aspects of language, and the function of conferences in business, industry and government settings.

COMM424 Communication in Complex Organizations (3 Credits)
Structure and function of communication within organizations: organizational climate and culture, information flow, networks and role relationships.

COMM425 Negotiation and Conflict Management (3 Credits)
Role of communication in shaping negotiation and conflict processes and outcomes.

COMM426 Conflict Management (3 Credits)
Role of communication in managing conflict processes.
Recommended: COMM425 and COMM250.

COMM427 Crisis Communication (3 Credits)
Explores theories and research related to communication before, during, and after a crisis. Students examine the fundamentals of organizational communication, crisis management, and strategic and crisis communication planning before examining case studies of a number of real-life crises: organizational crises, natural disasters, accidents, terrorism incidents, health crises, and major crises of credibility.

COMM428 Special Topics Seminar in Dialogues and Deliberation (3 Credits)
A study in public dialogue and deliberation theory and practice. This course will integrate recorded lectures, readings, videos, Public Dialogues, teamwork, and historical research.
Prerequisite: COMM250; and must have completed or be concurrently enrolled in COMM306.
Restriction: Must be in the Communication Major.
Repeatable to: 12 credits if content differs.

COMM434 Legal Communication (3 Credits)
Designed for professionals working in legal communication fields. The course is centered on knowledge of the legal process, legal terminology, theoretical and practical knowledge of legal communication, and knowledge of the U.S. legal system at the city, county, state, and federal levels.

COMM435 Theories of Interpersonal Communication (3 Credits)
Major theoretical approaches and research trends in the study of interpersonal communication.

COMM436 Interpersonal Arguing (3 Credits)
An examination of face to face arguing.
Prerequisite: COMM400 and COMM250.
Restriction: Must be in Communication program.
Credit Only Granted for: COMM436 or COMM498I.
Formerly: COMM498I.

COMM445 Principles and Practices to Facilitate Democratic Dialogue (3 Credits)
Exposes students to models of communication informed by democratic principles and research on facilitating dialogue and deliberation. Students research community groups, facilitate relational communication, and work through community issues.
Prerequisite: COMM345.
Credit Only Granted for: COMM445 or COMM428D.
Formerly: COMM428D.

COMM448 Special Topics in Public Relations (3 Credits)
Courses seek to examine historical and current communication management theories, literature and practices for the purposes of understanding the business environment in which public relations/communication management operates and applying the best of these theories and practices toward the management of the public relations/communications functions of an organization.
Prerequisite: COMM201.
Restriction: Must be in the Communication Major.
Repeatable to: 12 credits if content differs.

COMM449 Special Topics in Digital Communication (3 Credits)
Explores the topics that have arisen around computers, digital technologies, the internet, big data, surveillance capitalism, and network infrastructures.
Repeatable to: 12 credits if content differs.

COMM450 Ancient Worlds of Rhetoric (3 Credits)
A survey of rhetorical theory across different cultures in antiquity. Emphasizes cultural contexts in which rhetorical acts of advising, instructing, persuading, and arguing emerge. Draws connections between ancient theories and contemporary communication problems.
Prerequisite: COMM250.
Restriction: Must be in Communication program.
Credit Only Granted for: COMM450 or COMM650.

COMM452 Rhetoric, Technology, and Culture (3 Credits)
An investigation of the intersections between rhetoric, technology, and culture. Emphasizes critical and cultural approaches to communication technologies. Draws lessons from the history of rhetoric and media to inform contemporary understandings of communication in the context of digitality.

COMM454 Rhetoric of the 1960s (3 Credits)
Study of key rhetoric of the 1960s. Treats rhetoric of relevant Presidents and several protest movements including civil rights, anti-war, and women's liberation. Contrasts traditional modes of argument with alternative rhetorical forms.
Prerequisite: COMM301.

COMM456 Freedom of Speech & the First Amendment (3 Credits)
Examines the U.S. Supreme Court's rulings on freedom of speech cases as grounded in the First Amendment to the U.S. Constitution. It also considers the political and ideological role of "freedom of speech" as a rhetoric organizing and ordering U.S. political culture.
Credit Only Granted for: COMM498Y or COMM456.
Formerly: COMM498Y.

COMM458 Seminar in Political Communication (3 Credits)
The examination of special topics for and theories of political communication.
Prerequisite: COMM250.
Repeatable to: 12 credits if content differs.

COMM459 Special Topics in Science Communication (3 Credits)
This seminar course is designed to help students learn a variety of topics of science communication.
Repeatable to: 12 credits if content differs.

COMM460 Public Life in American Communities, 1634-1900 (3 Credits)
Ways that Americans have used their voice to create public life. Focus is on the diverse social communities that have characterized American life and the place and characteristics of oral discourse in each.

COMM461 Voices of Public Leadership in the Twentieth Century (3 Credits)
Study of the use of speaking in the power struggles of the twentieth century. Focus is on important speakers of the century, their social and policy influence, and the struggle to expand the diversity of voices with power in the public sphere.

COMM462 Visual Communication (3 Credits)
The study of visual communication should change the way one sees the world. Students will observe, analyze, and critique visual images. The ascendance of images in our contemporary world will be demonstrated, methods for critically comprehending how images do persuasive work will be identified, and students will develop a vocabulary for critiquing images, and assist students in creating compelling images.
Credit Only Granted for: COMM462 or COMM498V.
Formerly: COMM498V.

COMM468 Seminar in Mediated Communication (3 Credits)
The examination of special topics related to the study of mediated communication.
Restriction: Junior standing or higher.
Repeatable to: 12 credits if content differs.

COMM469 The Discourse of Social Movements (3 Credits)
Study of key social movements that have influenced American social and political life.
Recommended: COMM301.
Restriction: Junior standing or higher.
Repeatable to: 12 credits if content differs.

COMM470 Listening (3 Credits)
The principles of listening behavior.

COMM472 Nonverbal Communication (3 Credits)
Nonverbal communication in human interaction theory and research on proxemics, kinesics and paralanguage as expression of relationship, affect and orientation within and across cultures.

COMM475 Persuasion (3 Credits)
Bases of persuasion, with emphasis on recent experimental developments in persuasion.

COMM476 Language, Communication, and Action (3 Credits)
Communication as symbolic action through the study of communication ethics. Emerging ethical principles and decision-making in public discourse, interpersonal communication, organizational communication, public relations, health communication, and crisis communication.
Restriction: Must be in the Communication major.

COMM477 Discourse Analysis (3 Credits)
Concepts of textual and discourse analysis applied to speech situations.

COMM478 Communication Colloquium (1 Credit)
Current trends and issues in the field of communication, stressing recent research methods. Recommended for senior and graduate student majors and minors in communication.
Repeatable to: 4 credits if content differs.

COMM482 Intercultural Communication (3 Credits)
The major variables of communication in an intercultural context: cultural, racial and national differences; stereotypes; values; cultural assumptions; and verbal and nonverbal channels.

COMM483 Senior Seminar in Public Relations (3 Credits)
Integration of theory, techniques and research methods into the planning and execution of public relations campaigns for specific organizations. Analysis of research on the case studies of public relations.
Prerequisite: COMM351; and 1 course from (COMM305, COMM306, COMM307, or COMM400).
Additional Information: Students who enrolled after Fall 2020 should not take COMM400 as a prerequisite.

COMM488 Communication Portfolio Project (1 Credit)
Preparation of the professional communication portfolio.
Restriction: Senior standing; and must be in Communication program.
Repeatable to: 3 credits if content differs.

COMM489 Topical Research (1-3 Credits)
Individualized research projects conducted with a faculty sponsor.
Prerequisite: Permission of ARHU-Communication department.
Repeatable to: 6 credits if content differs.

COMM498 Seminar (3 Credits)
Present-day communication research.
Restriction: Permission of instructor; and senior standing.
Repeatable to: 12 credits.

COMX - Communication Education Abroad

COMX102 Introduction to Visual Culture (3 Credits)
Utilizes theory to understand the role of visual culture within daily lives, exploring a range of media from renaissance painting to TV, magazines, internet media, gaming and infographics. Explores visual media analysis; the evolution of visual codes; the impact of changing technologies; media literacy; information graphics literacy; meme and viral culture.
Additional Information: This course is offered as part of the Maryland-in-Rome study abroad program. Students must apply for this program through Education Abroad: More information at ter.ps/UMRome. Education Abroad processes registrations for this course on behalf of students.

COMX103 Communication and Society (3 Credits)
Explores the relationship between communications, media, society, and culture. Within historical and contemporary contexts, the subject addresses how audiences and participants negotiate media in their lives. Focuses on different media forms, from newspapers to television, and from books to mobile technology. Topics covered include the effects of media on audiences; issues of race and gender in the media; media ownership and regulation; the impact of technological development and institutional pressures on media uses, content, and patterns of communication. Assesses ethical and legal issues which media users and practitioners may face.
Additional Information: This course is offered as part of the Maryland-in-Rome study abroad program. Students must apply for this program through Education Abroad: More information at ter.ps/UMRome. Education Abroad processes registrations for this course on behalf of students.

COMX201 Social Media: an Italian Perspective (3 Credits)
The world of social media has its own specialized vocabulary. Key terms such as "social media strategy", "followers", "engagement" and "content marketing" will form the basis of our study. Nowadays, thanks to the internet, the small market downtown has enlarged its boundaries worldwide and mere shouting louder has been replaced by advertising through social media. Hence, the title of this course: Social media, yes, but from an Italian perspective.
Additional Information: This course is offered as part of the Maryland-in-Florence study abroad program. Students must apply for this program through Education Abroad: More information at ter.ps/UMFlorence. Education Abroad processes registrations for this course on behalf of students.

COMX300 Media and Gender (3 Credits)
Media representations of men and women influence and affect interpretations of sexual identities, interpretations of social roles, and perceptions of equality or inequality in society. This course reviews the extent and importance of media influences through a study of representations of men and women and alternative sexualities in the popular media and advertising in the latter half of the 20th century.
Additional Information: This course is offered as part of the Maryland-in-Rome study abroad program. Students must apply for this program through Education Abroad: More information at ter.ps/UMRome. Education Abroad processes registrations for this course on behalf of students.

COMX311 Social Media, Social Food (3 Credits)
What is "Social Media" and how will developing media skills help students plan successful careers in the world of food? This course will provide a perfect example of the importance of communication and social media in the food industry.
Credit Only Granted for: COMX200 or COMX311.
Formerly: COMX200.
Additional Information: This course is offered as part of the Maryland-in-Florence study abroad program. Students must apply for this program through Education Abroad: More information at ter.ps/UMFlorence. Education Abroad processes registrations for this course on behalf of students.

COMX312 Media and Globalization (3 Credits)
Provides students with critical perspectives on contemporary globalized media - where media are analyzed as industries, technological devices and transnational cultural flows. Adopts a comparative and historical perspective in the approach to the analysis of media and globalization. Explores how key areas history, industrialization, economics, and culture interact with contemporary international communication systems.
Additional Information: This course is offered as part of the Maryland-in-Rome study abroad program. Students must apply for this program through Education Abroad: More information at ter.ps/UMRome. Education Abroad processes registrations for this course on behalf of students.

COMX315 Strategic Communication (3 Credits)
Explores strategic communication in an increasingly complex world. Through theoretical perspectives, case studies, and a hands-on project develops a deeper understanding of the strategic framework that underlies efficient and meaningful communications. Includes two study tours which will allow engagement in various topics related to organizational, strategic, and personal communication and to meet professionals in the field.
Credit Only Granted for: N/A.
Additional Information: This course is offered as part of the Maryland-in-Copenhagen study abroad program. Students must apply for this program through Education Abroad: More information at ter.ps/UMCopenhagen. Education Abroad processes registrations for this course on behalf of students.

CPBE - College Park Scholars-Business, Society, and Entrepreneurship

CPBE100 College Park Scholars: Business, Society & Entrepreneurship First-Year Colloquium (1 Credit)
Introductory colloquium: Examination of issues related to business, society and entrepreneurship.
Restriction: Students must be matriculated into the College Park Scholars Business, Society & Entrepreneurship (CPBE) program.

CPBE101 College Park Scholars: Business, Society and Entrepreneurship First-Year Colloquium II (1 Credit)
The course is the second of three colloquia for the BSE Scholars program scheduled for their second semester (Spring). This colloquium is designed to emphasize the entrepreneurial focus of the BSE program by giving students the opportunity for practical, real-life and personal exposure to entrepreneurial activities.
Prerequisite: CPBE100.
Restriction: Students must be matriculated into the College Park Scholars Business, Society & Entrepreneurship program.

CPBE200 College Park Scholars: Business, Society and Entrepreneurship: Second-Year Colloquium I (1 Credit)
The third of three colloquia for the BSE Scholars program is designed to expose and engage students in real-life and real-time entrepreneurial challenges. BSE partners with two organizations that bring current and relevant challenges to the class. Students work in small teams to explore a highly experiential start-up challenge.
Prerequisite: CPBE101.
Restriction: Must be enrolled in the College Park Scholars Business, Society, & Entrepreneurship (CPBE) program.
Credit Only Granted for: CPSP218B or CPBE200.
Formerly: CPSP218B.

CPBE225 Enterprise Communications (3 Credits)
Examines basic interpersonal communication processes within written and oral channels, with practical applications for the business environment.
Prerequisite: CPBE100.
Restriction: Must be enrolled in College Park Scholars' Business, Society and Entrepreneurship (CPBE) program.
Formerly: CPSP220.

CPBE230 College Park Scholars: Business, Society & Entrepreneurship Internship Practicum (1-3 Credits)
Supervised internship project in an area related to business, society and entrepreneurship.
Prerequisite: CPBE100.
Restriction: Students must be matriculated into the College Park Scholars Business, Society & entrepreneurship (CPBE) program.

CPBE240 College Park Scholars: Business, Society & Entrepreneurship Service-Learning Practicum (1-3 Credits)
Supervised Service-Learning project in an area related to business, society and entrepreneurship.
Prerequisite: CPBE100.
Restriction: Students must be matriculated into the College Park Scholars Business, Society & Entrepreneurship (CPBE) program.

CPBE250 College Park Scholars: Business, Society & Entrepreneurship Research Practicum (1-3 Credits)
Supervised research project in an area related to business, society and entrepreneurship.
Prerequisite: CPBE100.
Restriction: Students must be matriculated into the College Park Scholars Business, Society & Entrepreneurship (CPBE) program.

CPBE270 Impacts of Globalization (3 Credits)
Introduces students to key global concepts, discusses a range of perspectives on globalization and cultural competence, and offers an applied learning experience.
Prerequisite: CPBE100; or by permission.
Cross-listed with: HONR298A.
Restriction: Students must be matriculated into the College Park Scholars Business, Society & Entrepreneurship (CPBE) program; or by permission.
Credit Only Granted for: CPBE270 or HONR298A.

CPCV - College Park Scholars-Civic Engagement for Social Good

CPCV100 College Park Scholars: Civic Engagement for Social Good First-Year Colloquium I (1 Credit)
Introductory colloquium: Examination of issues related to civic engagement.
Restriction: Must be in the College Park Scholars-Civic Engagement for Social Good (CPCV) program.
Credit Only Granted for: BSCV181 or CPCV100.
Formerly: BSCV181.

CPCV101 College Park Scholars: Civic Engagement for Social Good First-Year Colloquium II (1 Credit)
Examination of domestic societal issues and their national, regional, and local dimensions from political, economic, and policy perspectives. Students will work with local direct service non-profit organizations.
Prerequisite: CPCV100.
Restriction: Must be in the College Park Scholars Civic Engagement for Social Good (CPCV) program.
Credit Only Granted for: BSCV182 or CPCV101.
Formerly: BSCV182.

CPCV200 College Park Scholars: Civic Engagement for Social Good Second-Year Colloquium I (1 Credit)
Through substantive civic engagement work in local communities, in-person classes, and reflective practice, students will develop essential skills to collaborate with organizations and stakeholders in order to create meaningful change in their communities.
Prerequisite: CPCV101.
Restriction: Must be in the College Park Scholars-Civic Engagement for Social Good (CPCV) program.

CPCV225 Introduction to Civic Engagement for Social Good (3 Credits)
Foundational concepts and principles of community engagement and social change.
Restriction: Must be in the College Park Scholars-Civic Engagement for Social Good (CPCV) program.
Credit Only Granted for: BSCV191or CPCV225.
Formerly: BSCV191.

CPCV230 College Park Scholars: Civic Engagement for Social Good Internship Practicum (3 Credits)
As the culmination of the CESG experience, students gain hands-on experience in an area related to civic engagement through internships in non-profit organizations, political engagement, community outreach, or research labs. The internship gives students authentic experiences that help them develop hard and soft skills to support their community engagement efforts and their work toward social good.
Restriction: Must be in College Park Scholars - Civic Engagement for Social Good (CPCV).
Credit Only Granted for: BSCV302 or CPCV230.
Formerly: BSCV302.

CPDJ - College Park Scholars-Data Justice

CPDJ100 College Park Scholars: Data Justice First-Year Colloquium I (1 Credit)
Colloquium I, the first course in the College Park Scholars Data Justice program curriculum, will introduce students to a wide range of information issue areas, with an overarching theme for them to consider opportunities to improve the world by making data less biased and more accessible. The deliverables are intended as low-risk opportunities to write or design in response to the topics, and to engage students every week in creating something in response to what they are learning.
Restriction: Must be in College Park Scholars Data Justice Program (CPDJ).

CPDJ101 College Park Scholars: Data Justice: First-Year Colloquium II (1 Credit)
Colloquium II is an academic course that builds upon the foundation of Scholars learning in Colloquium I. Students will continue to discuss, propose, critique, simulate, and practice. Students will be asked to apply critical thinking and ethical frameworks to Data Justice topics, issues, and principles through reading, discussion, and group projects.
Restriction: Must be in the College Park Scholars Data Justice (CPDJ) program.
Formerly: CPSP118I.

CPDJ200 College Park Scholars: Data Justice: Second-Year Colloquium I (1 Credit)
This colloquium is designed to design the research, capstone and/or practicum on a project that reflects your academic interests, your current career goals, and utilizing skills and perspective learned thus far in the Data Justice program. To introduce students to a wide range of information issue areas, with an overarching theme for them to consider opportunities to improve the world by making data less biased and more accessible. The deliverables are intended as low-risk opportunities to write or design in response to the topics, and to engage students every week in creating something in response to what they are learning.
Prerequisite: CPDJ100.
Restriction: Must be in the College Park Scholars Data Justice (CPDJ) program.

CPDJ230 College Park Scholars: Data Justice Internship Practicum (3 Credits)
Through the internship practicum, students will be applying a data justice framework in a professional setting. Upon completion of 90 hours of supervised skill building via an approved internship, students will understand the connections between critical data theory and data justice in practice. In addition to their internship hours, their knowledge and skills will be assessed during weekly course meetings, through prompted journal entries, check-ins, and a poster at Scholars Academic Showcase. Their internship will be required to have an orientation towards building equity in the Information and Technology sector, building community awareness around data justice issues, or supporting an organization working on a community data justice issue.
Prerequisite: CPDJ200.
Restriction: Must be in the College Park Scholars Data Justice program.

CPDJ240 College Park Scholars: Data Justice Service-Learning Practicum (3 Credits)
Through the service-learning practicum, students will be applying a data justice framework in a professional setting. Upon completion of 90 hours of supervised skill building via service learning experiences, students will understand the connections between critical data theory and data justice in practice. In addition to their service-learning hours, their knowledge and skills will be assessed through prompted journal entries, check-ins, and a poster at Scholars Academic Showcase. Their service-learning will be required to have an orientation towards building equity in the Information and Technology sector, building community awareness around data justice issues, or supporting an organization working on a community data justice issue.
Prerequisite: CPDJ200.
Restriction: Must be in the College Park Scholars Data Justice program.

CPDJ250 College Park Scholars: Data Justice Research Practicum (3 Credits)
Through the research practicum, students will be applying a data justice framework to a research question. Upon completion of the research project, students will more deeply understand the connections between critical data theory and data justice. Their knowledge and skills will be assessed through check-ins, an annotated bibliography, a literature review, a prospectus, and a poster on that research presented at Scholars Academic Showcase. Their research will have an orientation towards building equity in the Information and technology sector, building community awareness around data justice issues, or supporting existing work on a community data justice issue.
Prerequisite: CPDJ200.
Restriction: Must be in the College Park Scholars Data Justice program.

CPET - College Park Scholars-Environment, Technology & Economy

CPET100 College Park Scholars: Environment, Technology & Economy First-Year Colloquium I (1 Credit)
Introductory colloquium: Examination of issues related to the convergence of the environment, technology and the economy.
Restriction: Students must be enrolled in the College Park Scholars Environment, Technology & Economy (CPET) program.

CPET101 College Park Scholars: Environment, Technology & Economy First-Year Colloquium II (3 Credits)
Introductory colloquium II: Continued examination of issues related to the convergence of the environment, technology and the economy. Group projects in sustainable development.
Prerequisite: CPET100.
Restriction: Students must be enrolled in the College Park Scholars Environment, Technology & Economy (CPET) program.

CPET200 College Park Scholars: Environment, Technology & Economy Second-Year Colloquium (1 Credit)
Advanced colloquium: Continued examination of issues related to sustainable development.
Prerequisite: CPET101.
Restriction: Students must be enrolled in the College Park Scholars Environment, Technology & Economy (CPET) program.

CPET230 College Park Scholars: Environment, Technology & Economy Internship Practicum (1-3 Credits)
Supervised internship project in an area related to the environment, technology and the economy.
Prerequisite: CPET200.
Restriction: Students must be matriculated into the College Park Scholars Environment, Technology & the Economy (CPET) program.

CPET240 College Park Scholars: Environment, Technology & Economy Service-Learning Practicum (1-3 Credits)
Supervised Service-Learning project in an area related to the environment, technology and the economy.
Restriction: Students must be matriculated into the College Park Scholars Environment, Technology & the Economy (CPET), Science, Technology & Society (CPSS), Arts (CPSA) and Business, Society, & Economy (CPBE) programs.

CPET250 College Park Scholars: Environment, Technology & Economy Research Practicum (1-3 Credits)
Supervised research project in an area related to the environment, technology and the economy.
Prerequisite: CPET200.
Restriction: Students must be matriculated into the College Park Scholars Environment, Technology & the Economy (CPET) program.

CPGH - College Park Scholars-Global Public Health

CPGH100 College Park Scholars: Global Public Health First-Year Colloquium I (1 Credit)
Introductory colloquium: Examination of factors that determine the health status of populations around the world.
Restriction: Students must be enrolled in the College Park Scholars Global Public Health (CPGH) program.

CPGH101 College Park Scholars: Global Public Health First-Year Colloquium II (1 Credit)
Using case studies, students will examine necessary components to design successful public health interventions.
Prerequisite: CPGH100.
Restriction: Students must be enrolled in the College Park Scholars Global Public Health (CPGH) program.

CPGH200 College Park Scholars: Global Public Health Second-Year Colloquium (1 Credit)
Building on knowledge and skills gained from the first-year colloquia, students will develop public health interventions that address a public health issue of a particular community.
Prerequisite: CPGH101.
Restriction: Students must be enrolled in the College Park Scholars Global Public Health (CPGH) program.

CPGH230 College Park Scholars: Global Public Health - Internship Practicum (1-3 Credits)
Supervised internship project in an interest area related to global public health.
Prerequisite: CPGH200.
Restriction: Students must be enrolled in the College Park Scholars Global Public Health (CPGH) program.

CPGH240 College Park Scholars: Global Public Health Service-Learning Practicum (1-3 Credits)
Supervised Service-Learning project in an interest area related to global public health.
Prerequisite: CPGH200.
Restriction: Students must be enrolled in the College Park Scholars Global Public Health (CPGH) program.

CPGH250 College Park Scholars: Global Public Health Research Practicum (1-3 Credits)
Supervised research project in an interest area related to global public health.
Prerequisite: CPGH200.
Restriction: Students must be enrolled in the College Park Scholars Global Public Health (CPGH) program.

CPGH270 College Park Scholars: Global Public Health Education Abroad Practicum (1-3 Credits)
Education abroad experience in an interest area related to global public health.
Prerequisite: CPGH200.
Restriction: Students must be enrolled in the College Park Scholars Global Public Health (CPGH) program.

CPJT - College Park Scholars-Justice and Legal Thought

CPJT100 College Park Scholars: Justice & Legal Thought: First-Year Colloquium (1 Credit)
Students will gain an experiential understanding of law and justice by investigating concepts and frameworks of justice and apply them to real-world experience.
Restriction: Students must be enrolled in the College Park Scholars Justice & Legal Thought (CPJT) program.

CPJT101 Colloquium in Justice and Legal Thought (1 Credit)
An exploration of contemporary issues related to justice and legal thought.

CPJT200 Justice and legal Thought Second Year Colloquium (1 Credit)
Advanced colloquium for second year students related to research skill development
Restriction: Students must be enrolled in the College Park Scholars Justice and Legal Thought (CPJT) program.
Additional Information: When combined with the first year CPJT colloquia, students will learn how to research issues discussed and debated throughout year one.

CPJT230 Capstone for Justice and Legal Thought: Internship (2-3 Credits)
The capstone of the four-semester College Park Scholars Justice and Legal thought citation program is an exploration of justice and law within a rigorous academic and experiential framework. Students must develop and perform practicum internships in professional law related settings. In all settings, students must interact directly with legal professionals in law related fields and through law-related institutions under the supervision of legal professionals and program staff. In conjunction with the experiential component, students will synthesize their experience within the learning outcomes of the Justice and Legal Thought Program through an innovative final project culminating in a poster presentation.

CPJT240 Capstone for Justice and Legal Thought: Service-Learning (2-3 Credits)
The capstone of the four-semester College Park Scholars Justice and Legal Thought citation program is an exploration of justice and law within a rigorous academic and experiential framework. Students must develop and perform practicum volunteer experiences in professional law related settings. In all settings, students must interact directly with legal professionals in law related fields and through law-related institutions under the supervision of legal professionals and program staff. In conjunctions with the experiential component, students will synthesize their experience within the learning outcomes of the Justice and Legal Thought program through an innovative final project culminating in a poster presentation.
Prerequisite: CPJT200.
Restriction: Must be in the College Park Scholars Justice & Legal Thought (CPJT) Program.

CPJT250 Capstone for Justice and Legal Thought: Research (2 Credits)
The capstone of the four-semester College Park Scholars Justice and Legal Thought citation program is an exploration of justice and law within a rigorous academic and experiential framework. Students must develop and perform applied research in a law related setting. Students must interact directly with legal professionals under the supervision of program staff. Students will synthesize their experience within the learning outcomes of the Justice and Legal Thought Program through an innovative final research project culminating in a poster presentation.

CPMS - College Park Scholars-Media, Self and Society

CPMS100 College Park Scholars: Media, Self & Society First-Year Colloquium I (1 Credit)
Introductory colloquium: Examination of issues related to the media.
Restriction: Students must be enrolled in the College Park Scholars Media, Self & Society (CPMS) program.

CPMS101 College Park Scholars: Media, Self & Society First-Year Colloquium II (1 Credit)
Examination of the media's coverage of topical issues.
Prerequisite: CPMS100.
Restriction: Students must be enrolled in the College Park Scholars Media, Self & Society (CPMS) program.

CPMS200 College Park Scholars: Media, Self and Society: Second-Year Colloquium I (1 Credit)
Builds on the foundational media skills that Media Scholars students learned in their freshman year. Students will continue to analyze and create media, but this semester we will place more emphasis on media in your field and major. Students will develop proficiency in using advanced digital media tools, build their professional online presence, enhance their communication and presentation skills, and analyze the changing media landscape - valuable competencies for success in their chosen fields.
Prerequisite: CPMS101.
Restriction: Must be enrolled in the College Park Scholars Media, Self and Society (CPMS) program.
Credit Only Granted for: CPSP218J or CPMS200.
Formerly: CPSP218J.

CPMS225 Analyzing Media Practice through Theory (3 Credits)
Media analysis investigating patterns of ownership, the working of media organizations, patterns of coverage and the nature of audiences.
Prerequisite: CPMS100.
Restriction: Must be in the Scholars Media, Self & Society Program.
Formerly: CPSP222.

CPMS230 College Park Scholars: Media, Self & Society - Internship Practicum (1-3 Credits)
Supervised internship project in an area related to media, self and society.
Prerequisite: CPMS101.
Restriction: Students must be enrolled in the College Park Scholars Media, Self & Society (CPMS) program.

CPMS240 College Park Scholars: Media, Self & Society - Service-Learning Practicum (1-3 Credits)
Supervised Service-Learning project in an area related to media, self and society.
Prerequisite: CPMS101.
Restriction: Students must be enrolled in the College Park Scholars Media, Self & Society (CPMS) program.

CPPL - College Park Scholars-Public Leadership

CPPL100 College Park Scholars: Public Leadership First-Year Colloquium I (1 Credit)
Introductory colloquium: Examination of issues related to public leadership.
Restriction: Students must be enrolled in the College Park Scholars Public Leadership (CPPL) program.

CPPL101 College Park Scholars: Public Leadership First-Year Colloquium II (1 Credit)
Continued examination of issues related to public leadership. Development of team, community-based learning project proposals.
Prerequisite: CPPL100.
Restriction: Students must be enrolled in the College Park Scholars Public Leadership (CPPL) program.

CPPL200 College Park Scholars: Public Leadership - Applied Leadership Capstone I (1 Credit)
Planning and initiation of team, community-based-learning projects.
Prerequisite: CPPL101.
Restriction: Students must be enrolled in the College Park Scholars Public Leadership (CPPL) program.

CPPL201 College Park Scholars: Public Leadership - Applied Leadership Capstone II (2 Credits)
Implementation and evaluation of team, community-based-learning projects.
Prerequisite: CPPL200.
Restriction: Students must be enrolled in the College Park Scholars Public Leadership (CPPL) program.

CPSA - College Park Scholars-Arts

CPSA100 College Park Scholars: Arts First-Year Colloquium I (1 Credit)
Introductory colloquium: Aesthetic, intellectual and personal examination of the arts.
Restriction: Students must be matriculated into the College Park Scholars Arts (CPSA) program.

CPSA101 College Park Scholars: Arts First-Year Colloquium II (1-2 Credits)
Introductory colloquium II: Arts workshops and Arts Festival.
Prerequisite: CPSA100.
Restriction: Students must be matriculated into the College Park Scholars Arts (CPSA) program.

CPSA149 College Park Scholars: Arts Service-Learning Outreach (2 Credits)
Service-Learning outreach to Prince George's County schools and non-profit agencies.
Restriction: Students must be matriculated into the College Park Scholars Arts (CPSA) program.
Repeatable to: 6 credits.

CPSA200 College Park Scholars: Arts Second-Year Colloquium I (1 Credit)
Advanced colloquium I: Examination of the arts in society; and preparation for "Scholarship-in-Practice" project.
Prerequisite: CPSA101.
Restriction: Students must be matriculated into the College Park Scholars Arts (CPSA) program.
Additional Information: When paired with successful completion of CPSA 240, 250 or 260, students will earn General Education Scholarship-in-Practice credit.

CPSA201 College Park Scholars: Arts Second-Year Colloquium II (1-2 Credits)
Advanced colloquium II: Arts workshop and Arts Festival.
Prerequisite: CPSA200.
Restriction: Students must be matriculated into the College Park Scholars Arts (CPSA) program.

CPSA240 College Park Scholars: Arts Service-Learning Practicum (2 Credits)
Supervised Service-Learning project in an area related to the arts.
Prerequisite: CPSA200.
Restriction: Students must be matriculated into the College Park Scholars Arts (CPSA) program.
Additional Information: When paired with successful completion of CPSA 200, students will earn General Education Scholarship-in-Practice credit.

CPSA250 College Park Scholars: Arts Research Practicum (2 Credits)
Supervised research project in an area related to the arts.
Prerequisite: CPSA200.
Restriction: Students must be matriculated into the College Park Scholars Arts (CPSA) program.
Additional Information: When paired with successful completion of CPSA 200, students will earn General Education Scholarship-in-Practice credit.

CPSA260 College Park Scholars: Arts Peer-Teaching Practicum (2 Credits)
Supervised peer-teaching project in an area related to the arts.
Prerequisite: CPSA200.
Restriction: Students must be matriculated into the College Park Scholars Arts (CPSA) program.
Additional Information: When paired with successful completion of CPSA 200, students will earn General Education Scholarship-in-Practice credit.

CPSD - College Park Scholars-Science, Discovery & the Universe

CPSD100 College Park Scholars: Science, Discovery & the Universe First-Year Colloquium A (1 Credit)
Introductory colloquium: Examination of issues related to science, discovery and the universe.
Restriction: Students must be enrolled in the College Park Scholars Science, Discovery & the Universe (CPSD) program.
Additional Information: Both freshman colloquia (CPSD 100 and 101) are required for students to earn their College Park Scholars citations; however, they can be taken in any order during a student's first year.

CPSD101 College Park Scholars: Science, Discovery & the Universe First-Year Colloquium B (1 Credit)
Introductory colloquium: Examination of the intersection of astronomy and culture; and the roles of science, exploration and communication in the process of discovery.
Restriction: Students must be enrolled in the College Park Scholars Science, Discovery & the Universe (CPSD) program.
Additional Information: Both freshman colloquia (CPSD 100 and 101) are required for students to earn their College Park Scholars citations; however, they can be taken in any order during a student's first year.

CPSD200 College Park Scholars: Science, Discovery & the Universe Second-Year Colloquium (1 Credit)
Advanced colloquium: Continued examination of issues related to science, discovery and the universe.
Prerequisite: CPSD100 and CPSD101.
Restriction: Students must be enrolled in the College Park Scholars Science, Discovery & the Universe (CPSD) program.

CPSD230 College Park Scholars: Science, Discovery & the Universe - Internship Practicum (1-3 Credits)
Supervised internship project in an interest area related to science, discovery and the universe.
Prerequisite: CPSD200.
Restriction: Students must be enrolled in the College Park Scholars Science, Discovery & the Universe (CPSD) program.

CPSD240 College Park Scholars: Science, Discovery & the Universe - Service-Learning Practicum (1-3 Credits)
Supervised Service-Learning project in an interest area related to science, discovery and the universe.
Prerequisite: CPSD200.
Restriction: Students must be enrolled in the College Park Scholars Science, Discovery & the Universe (CPSD) program.

CPSD250 College Park Scholars: Science, Discovery & the Universe - Research Practicum (1-3 Credits)
Supervised research project in an interest area related to science, discovery and the universe.
Prerequisite: CPSD200.
Restriction: Students must be enrolled in the College Park Scholars Science, Discovery & the Universe (CPSD) program.

CPSF - College Park Scholars-Life Sciences

CPSF100 College Park Scholars: Life Sciences First-Year Colloquium I (1 Credit)
Introductory colloquium: Examination of issues related to the life sciences.
Restriction: Students must be enrolled in the College Park Scholars Life Sciences (CPSF) program.

CPSF101 College Park Scholars: Life Sciences First-Year Colloquium II (1 Credit)
Further examination of issues related to the life sciences.
Prerequisite: CPSF100.
Restriction: Students must be enrolled in the College Park Scholars Life Sciences (CPSF) program.

CPSF200 College Park Scholars: Life Sciences Second-Year Colloquium (1 Credit)
This course is the final of a three-semester sequence within the College Park Scholars- Life Sciences Program. In the first semester, our content focused on community; we built community as a program of unique individuals to create a common identity and discussed the ways in which the science community exists. The second semester allowed us to explore the life sciences through our lenses of curiosity; we asked big questions and moved toward big answers. This semester is focused on engagement. We will take time to be fully present in the life sciences community and learn why it is important to gain practical knowledge and experiences to further the goals and aims of science.
Prerequisite: CPSF101.
Restriction: Must be in the College Park Scholars Life Sciences program.
Credit Only Granted for: CPSF200 or CPSP218L.
Formerly: CPSP218L.

CPSG - College Park Scholars-Science and Global Change

CPSG100 College Park Scholars: Science & Global Change First-Year Colloquium I (1 Credit)
Introductory colloquium: Examination of issues related to science and global change.
Restriction: Students must be enrolled in the College Park Scholars Science & Global Change (CPSG) program.

CPSG101 College Park Scholars: Science & Global Change First-Year Colloquium II (1 Credit)
Introductory colloquium II: Continued examination of issues related to science and global change.
Prerequisite: CPSG100.
Restriction: Students must be enrolled in the College Park Scholars Science & Global Change (CPSG) program.

CPSG200 College Park Scholars: Science & Global Change Second-Year Colloquium (1 Credit)
Advanced colloquium: Continued examination of issues related to science and global change.
Prerequisite: CPSG101.
Restriction: Students must be enrolled in the College Park Scholars Science & Global Change (CPSG) program.

CPSG230 College Park Scholars: Science & Global Change - Internship Practicum (1-3 Credits)
Supervised internship in an interest area related to science and global change.
Prerequisite: CPSG200.
Restriction: Students must be enrolled in the College Park Scholars Science & Global Change (CPSG) program.

CPSG240 College Park Scholars: Science & Global Change - Service-Learning Practicum (1-3 Credits)
Supervised Service-Learning experience in an interest area related to science and global change.
Prerequisite: CPSG200.
Restriction: Students must be enrolled in the College Park Scholars Science & Global Change (CPSG) program.

CPSG250 College Park Scholars: Science & Global Change - Research Practicum (1-3 Credits)
Supervised research experience in an interest area related to science and global change.
Prerequisite: CPSG200.
Restriction: Students must be enrolled in the College Park Scholars Science & Global Change (CPSG) program.

CPSN - College Park Scholars-International Studies

CPSN100 College Park Scholars: International Studies First-Year Colloquium I (1 Credit)
Introductory colloquium: Examination of issues related to international studies.
Restriction: Students must be enrolled in the College Park Scholars International Studies (CPSN) program.

CPSN101 College Park Scholars: International Studies First-Year Colloquium II (1 Credit)
Introductory colloquium II: Continued examination of issues related to international studies.
Prerequisite: CPSN100.
Restriction: Students must be enrolled in the College Park Scholars International Studies (CPSN) program.
Additional Information: When paired with the successful completion of CPSN 100, students will earn Diversity/Cultural Competence General Education credits.

CPSN200 College Park Scholars: International Studies Second-Year Colloquium I (1 Credit)
This sophomore colloquium aims to help prepare College Park Scholars International Studies students with practical, translatable knowledge and capabilities that are required to enter and contribute constructively to addressing pressing challenges as global citizens. Building on their previous two colloquiua, students are (1) introduced to practical realities of developing projects, programs, and policies to address the world's grand challenges, including those associated with exposures to new settings, cultures, and issues; (2) trained in hard skills necessary to design, plan, implement, and evaluate projects and policies effectively and ethically; (3) instructed in practical, efficient research with applied relevance; and (4) exposed to strategies of entrepreneurship and innovation.
Prerequisite: CPSN101.
Restriction: Must be enrolled in the College Park Scholars International Studies (CPSN) program.

CPSN230 College Park Scholars: International Studies - Internship Practicum (1-3 Credits)
Supervised internship project in an area related to international studies.
Prerequisite: CPSN101.
Restriction: Students must be enrolled in the College Park Scholars International Studies (CPSN) program.

CPSN240 College Park Scholars: International Studies - Service-Learning Practicum (1-3 Credits)
Supervised Service-Learning project in an area related to international studies.
Prerequisite: CPSN101.
Restriction: Students must be enrolled in the College Park Scholars International Studies (CPSN) program.

CPSN250 College Park Scholars: International Studies - Research Practicum (1-3 Credits)
Supervised research in an area related to international studies.
Prerequisite: CPSN101.
Restriction: Students must be enrolled in the College Park Scholars International Studies (CPSN) program.

CPSP - College Park Scholars Program

CPSP118 College Park Scholars First-Year Colloquium I (1-3 Credits)
Introductory colloquium for specific College Park Scholars Program.
Restriction: Must be in the College Park Scholars Program.
Repeatable to: 3 credits.

CPSP119 College Park Scholars First-Year Colloquium II (1-3 Credits)
Intermediate colloquium for specific College Park Scholars Programs.
Prerequisite: CPSP118.
Restriction: Must be in the College Park Scholars Program.
Repeatable to: 3 credits.

CPSP210 Art-Tech Studio: Integrations of the Arts and Technology for Change Making (3 Credits)
Students will investigate various cultures of the arts and technology through ethnographic study. We will work collaboratively to make meaning of the relationships among these cultures in the context of social justice for communities. We will learn arts techniques and each student will envision a fusion of the arts and technology to support a more just and equitable future for a community of interest.
Restriction: Must be in the College Park Scholars Program; or permission of College Park Scholars.
Credit Only Granted for: CPSP318 or CPSP210.
Additional Information: If seats are available after CPS students have registered, permission will be granted to students outside CPS to take the course.

CPSP218 College Park Scholars Second-Year Colloquium I (1-3 Credits)
Colloquium for specific College Park Scholars Program.
Prerequisite: CPSP118.
Restriction: Must be in the College Park Scholars Program.
Repeatable to: 3 credits.

CPSP219 College Park Scholars Second-Year Colloquium II (1-3 Credits)
Intermediate colloquium for specific, second year, College Park Scholars Program.
Prerequisite: CPSP218.
Restriction: Must be in the College Park Scholars Program.
Repeatable to: 3 credits if content differs.

CPSP220 Where the Waters Blend: Contemporary Indigenous Perspectives on History, Traditions, and Modern Issues (3 Credits)
In this unique cultural and personal learning experience, students will explore the history, traditions, and contemporary issues faced by Maryland's Indigenous people, particularly the Piscataway. The course emphasizes the interconnectedness of culture and environment, highlighting how Indigenous Ecological Knowledges shape our understanding of biodiversity and interconnected life. The experiential work of the course asks students to consider how the past matters, particularly when it is embodied in the land they live on, and their present obligations to it. On-campus and place-based learning focuses on the impacts of colonization on the Piscataway - cultural suppression, land displacement, and their effects today - and fosters students' capacity to challenge paradigms that marginalize Indigenous people in our region, nation, and world. Students will emerge with a greater understanding of Maryland's land, the critical role of biodiversity, and the resilience of the Piscataway culture.
Cross-listed with: HNUH258Q.
Credit Only Granted for: HNUH268W, HNUH258Q or CPSP220.
Formerly: HNUH268W.

CPSP229 Practicum: Online Communication (1-3 Credits)
Supervised practicum in Website development.
Restriction: Must be in the College Park Scholars Program.
Repeatable to: 3 credits if content differs.

CPSP239 Practicum: Internship (1-3 Credits)
Supervised internship in interest area related to the theme of the students' College Park Scholars program.
Restriction: Must be in the College Park Scholars Program.
Repeatable to: 3 credits.

CPSP249 Practicum: Service-Learning (1-3 Credits)
Supervised Service-Learning project in area related to the theme of the students' College Park Scholars program.
Restriction: Must be in the College Park Scholars Program.
Repeatable to: 3 credits.

CPSP259 Practicum: Research (1-3 Credits)
Supervised research project in interest area related to the students' College Park Scholars program.
Restriction: Must be in the College Park Scholars Program.
Repeatable to: 3 credits.

CPSP269 Practicum: Peer Teaching (1-3 Credits)
Supervised peer teaching in students' College Park Scholars program.
Restriction: Must be in the College Park Scholars Program.
Repeatable to: 3 credits.

CPSP279 Practicum: Study Abroad (1-3 Credits)
Supervised international experience that satisfies students' College Park Scholars practicum requirement.
Restriction: Must be in the College Park Scholars Program.
Repeatable to: 3 credits if content differs.

CPSP300 Intergroup Dialogue Facilitator Development & Practicum (3 Credits)
Facilitation is an artform and a science. This course is designed to introduce students to foundational dialogue facilitation skills and social justice frameworks needed to effectively facilitate group interactions across and within social differences. Students will apply the skills learned by facilitating a multi-session dialogue course with either the Common Ground or the Words of Engagement Intergroup Dialogue Program (WeIDP).
Cross-listed with: EDDI300, HONR300.
Restriction: Permission of the Counseling, Higher Education, and Special Education department.
Credit Only Granted for: WEID300, CPSP300, HONR300, or EDDI300.
Formerly: WEID300.
Additional Information: Students must be given permission to enroll and be admitted to the intergroup dialogue facilitator program.

CPSP318 College Park Scholars Special Topics (1-3 Credits)
Special Topics learning opportunities in College Park Scholars.
Restriction: Must be in the College Park Scholars Program.
Repeatable to: 3 credits.

CPSP339 Advanced Practicum: Internship (1-3 Credits)
Independent study designed for students who wish to extend in greater depth and detail projects begun in sophomore year. Subject varies. Overseen by faculty director or mentor.
Prerequisite: CPSP239.
Restriction: Must be in the College Park Scholars Program.
Repeatable to: 3 credits.

CPSP349 Advanced Practicum: Service Learning (1-3 Credits)
Advanced supervised Service-Learning project.
Prerequisite: CPSP249.
Restriction: Must be in the College Park Scholars Program.
Repeatable to: 3 credits.

CPSP359 Advanced Practicum: Research (1-3 Credits)
Advanced supervised internship experience.
Prerequisite: CPSP259.
Restriction: Must be in the College Park Scholars Program.
Repeatable to: 3 credits.

CPSP369 Advanced Practicum: Peer Teaching (1-3 Credits)
Supervised advanced practicum in peer instruction.
Restriction: Must be in the College Park Scholars Program.
Repeatable to: 6 credits.

CPSP379 Advanced Practicum: Study Abroad (1-3 Credits)
Advanced, supervised study-abroad experience.
Restriction: Must be in the College Park Scholars Program; or permission of UGST-College Park Scholars.
Repeatable to: 3 credits if content differs.

CPSP386 Experiential Learning (3-6 Credits)

CPSP388 Advanced Special Topics in College Park Scholars (1-3 Credits)
Interdisciplinary topics of special interest to College Park Scholars, such as legacies of the cold war, environmental ethics, women in leadership, and other timely issues. Projects build on previous work in College Park Scholars.
Restriction: Must be in the College Park Scholars Program.
Repeatable to: 6 credits if content differs.

CPSS - College Park Scholars-Science, Technology and Society

CPSS100 College Park Scholars: Science, Technology & Society First-Year Colloquium I (2 Credits)
Introductory colloquium: Examination of issues related to science, technology and society.
Restriction: Students must be enrolled in the College Park Scholars Science, Technology & Society (CPSS) program.

CPSS101 College Park Scholars: Science, Technology & Society First-Year Colloquium II (1 Credit)
Continued examination of issues related to science, technology and society.
Prerequisite: CPSS100.
Restriction: Students must be enrolled in the College Park Scholars Science, Technology & Society (CPSS) program.

CPSS220 The Future of Communicating Science (3 Credits)
How can scientists communicate their work effectively? The field of science communication ventures that the answer is not simply a matter of improving capacity (e.g., because people lack scientific information, scientists lack communication skills, or both). Rather, it calls for sustained collaboration and empathy between laypersons and experts. In this hands-on, experiential course, we use a model of cultural competency to put forth solutions to bridge the expert-lay divide. We investigate typical venues in which science is communicated (museums, YouTube videos, federal agency websites, and much much more) and study best practices for communication. Then we explore emerging venues that support sustained contact between so-called "lay citizens" and scientific or technical experts (dance/improv techniques, ethnographic methods and citizen science). Students learn to use cross-cultural perspectives as a basis to pilot and test ways of strengthening relationships and improving communication.
Restriction: Must be in the College Park Scholars Science, Technology or Society program or have permission of the program.

CPSS225 College Park Scholars Capstone: Science, Technology, and Society (3 Credits)
Exploration and understanding of ways science and technology shape and are shaped by society.
Prerequisite: CPSS100.
Restriction: Must be in the College Park Scholars Science, Technology & Society (CPSS) program.
Formerly: CPSP227.

CPSS230 College Park Scholars: Science, Technology & Society - Internship Practicum (1 Credit)
Supervised internship in an area related to science, technology and society.
Prerequisite: CPSS101.
Restriction: Matriculation into the College Park Scholars Science, Technology & Society (CPSS) program.

CPSS240 College Park Scholars: Science, Technology & Society - Service-Learning Practicum (3 Credits)
Supervised Service-Learning practicum in issues related to science, technology and society.
Restriction: Matriculation into the College Park Scholars Science, Technology & Society (CPSS) program; or permission of instructor.

CPSS260 College Park Scholars: Science, Technology & Society - Peer-Teaching Practicum (1 Credit)
Supervised peer teaching in science, technology and society.
Prerequisite: CPSS101.
Restriction: Matriculation into the College Park Scholars Science, Technology & Society (CPSS) program.

CPSS270 Education Abroad Practicum: Chip Technologies in Taiwan (3 Credits)
This education abroad course provides a comprehensive exploration of Taiwan's pivotal role in the global semiconductor industry. Students will gain insights into the history, engineering culture, and impact of chip technologies on Taiwan's economy and international relations. Through lectures, discussions, readings, and field-based research and practice, students will develop a deep understanding of the semiconductor ecosystem, its challenges, and opportunities, and its influence on the world.

CPSS340 College Park Scholars: Infrastructure and Society (3 Credits)
One of the most important, and underappreciated, aspects of our society is its infrastructure (roads, buildings, communication systems, water delivery systems, sanitation systems, energy systems, etc.). We often take for granted the services infrastructure bring us. As a consequence, the United States, which at one time was a world leader in creating infrastructure, is experiencing an infrastructure crisis. Furthermore, not everyone experiences this issue equally. This course is designed to identify the root causes of the crisis. You will explore emerging social, political, legal, cultural, and social justice issues associated with the building and maintenance of infrastructure from the perspective of Science and Technology Studies (STS) and engineers. You will work with a volunteer corps of professional engineers from a variety of disciplines on a service-learning project designed to assess the safety and vitality of infrastructure.
Restriction: Must be currently enrolled in a College Park Scholars program.
Credit Only Granted for: CPSP349T or CPSS340.
Formerly: CPSP349T.

CPSS370 Education, Technology and Society: Ecuador in Context (3 Credits)
Set in the UNESCO World Heritage site of Cuenca, Ecuador, students in this short-term study abroad course use theory from Science and Technology Studies (STS) to explore, discuss and critique the design, development and implementation of technology-based social programs in Ecuador. The program looks at education and technology throughout multiple lenses and contexts. Collaboration with the University of Cuenca, participating students have the opportunity for both university and field-based research and practice. UMD students work alongside students and faculty from the leaders and practitioners from UCuenca, government agencies, nongovernmental organizations, small business and local communities.
Recommended: 1 course from (ENES240, ENES200, or ENEE200).
Cross-listed with: ENES359T, LACS370.
Restriction: Minimum cumulative GPA of 2.5.
Credit Only Granted for: ENES259T, ENES359T, CPSP279T, LASC269T, CPSS370, or LACS370.
Formerly: ENES259T.

DANC - Dance

DANC109 Choreography I: Improvisation (3 Credits)
An introduction to the process of spontaneous movement discovery involving solo and group movement experiences.
Restriction: Must be in Dance program; or permission of ARHU-School of Theatre, Dance & Performance Studies department.
Repeatable to: 6 credits if content differs.

DANC118 Beginning Tap (2 Credits)
Introduction to tap for the beginning student.
Repeatable to: 4 credits.

DANC119 Introduction to American Social Dance (2 Credits)
Social dance forms of North America.
Repeatable to: 4 credits.

DANC128 Fundamentals of Ballet (2 Credits)
Introduction to ballet technique and terminology for the beginning student.
Restriction: Must not be in Dance program.
Repeatable to: 4 credits.

DANC138 Global Dance Forms (2 Credits)
Movement course. Traditional dances and music of selected cultures.
Repeatable to: 6 credits if content differs.

DANC148 Fundamentals of Modern Dance (2 Credits)
Introduction to modern dance with emphasis on the development of fundamental movement skills.
Restriction: Must not be in Dance program.
Repeatable to: 4 credits.

DANC149 Fundamentals of Modern Dance II (2 Credits)
Continuation of the development of axial and locomotor movement skills with emphasis on the development of functional alignment, musicality, range of movement, coordination, and movement memory.
Prerequisite: DANC148.
Repeatable to: 4 credits.

DANC158 Fundamentals of Jazz (2 Credits)
Introduction to the jazz style in dance for the beginning student.
Restriction: Must not be in Dance program.
Repeatable to: 4 credits.

DANC179 Movement Integration (2 Credits)
Conditioning and re-patterning techniques for achieving integrated movement.
Restriction: Permission of ARHU-Dance department.
Repeatable to: 4 credits if content differs.

DANC199 Practicum in Choreography, Production and Performance I (1-3 Credits)
Choreography, production, and performance of student works, both on and off campus.
Restriction: Permission of ARHU-School of Theatre, Dance & Performance Studies department.
Repeatable to: 6 credits.

DANC200 Introduction to Dance (3 Credits)
A study of dance as a form of communication and as an art form; a survey of the theories and styles of dance, and their relationships to other art forms.

DANC207 Choreography II: The Creative Process (3 Credits)
Explorations in movement, music, words, objects, and environments through improvisation and choreographic problem solving.
Prerequisite: DANC109.
Restriction: Permission of ARHU-Dance department.

DANC208 Choreography I (3 Credits)
Basic principles of dance composition: space, time, dynamics, and movement invention. The development of critical awareness.
Prerequisite: DANC109 and DANC102.
Repeatable to: 6 credits.

DANC209 Dance Composition (3 Credits)
Exploration of the structural elements of dance composition.
Prerequisite: DANC207.
Restriction: Permission of ARHU-Dance department.
Repeatable to: 6 credits if content differs.

DANC218 Modern Dance I (3 Credits)
Development of heightened body awareness, breath support, dynamic alignment, and spatial awareness. Focus on rhythmic clarity and musicality.
Restriction: Permission of ARHU-Dance department.
Repeatable to: 6 credits if content differs.

DANC219 Modern Dance II (3 Credits)
Continuation of the elements addressed in DANC218 with an added focus on momentum, the use of counter-tension, stability/mobility, suspension, and dynamic range.
Prerequisite: DANC218.
Restriction: Permission of ARHU-Dance department.
Repeatable to: 6 credits if content differs.

DANC228 Ballet I (2 Credits)
Barre and center work for alignment, strength, flexibility and coordination. Introduction to ballet terminology.
Restriction: Permission of ARHU-School of Theatre, Dance & Performance Studies department.
Repeatable to: 4 credits.

DANC229 Ballet II (2 Credits)
Continuation of DANC228.
Restriction: Permission of ARHU-School of Theatre, Dance & Performance Studies department.
Repeatable to: 4 credits.

DANC248 Modern Dance I (3 Credits)
Body alignment, rhythm, dynamics, space and dance phrases.
Restriction: Must be in Dance program; or permission of ARHU-School of Theatre, Dance & Performance Studies department.
Repeatable to: 6 credits.

DANC249 Modern Dance II (3 Credits)
Continuation of DANC248.
Prerequisite: DANC248; and permission of ARHU-School of Theatre, Dance & Performance Studies department.
Repeatable to: 6 credits.

DANC258 Jazz I (2 Credits)
Jazz warm-ups and combinations emphasizing rhythm and movement isolations.
Prerequisite: DANC158.
Restriction: Must be in Dance program.
Repeatable to: 4 credits.

DANC259 Jazz II (2 Credits)
Continuation of the principles of Jazz I. Emphasis on style and execution of movement.
Prerequisite: DANC258.
Repeatable to: 4 credits.

DANC269 Special Topics in Study Abroad II (1-6 Credits)
Special topics course taken as part of an approved study abroad program.
Repeatable to: 15 credits if content differs.

DANC299 Practicum in Choreography, Production and Performance II (1-3 Credits)
Continuation of DANC199.
Prerequisite: DANC199; or permission of ARHU-School of Theatre, Dance & Performance Studies department.
Repeatable to: 6 credits.

DANC304 Dance Education I: Foundations (3 Credits)
Organization and content of the studio dance class. Structuring developmentally appropriate dance experiences for students ages 3-18.
Restriction: Permission of ARHU-Dance department.

DANC308 Choreography II (3 Credits)
Exploration of the formal elements of choreography; theme, development, repetition, contrast, transition, continuity and structure.
Prerequisite: DANC208.
Repeatable to: 6 credits.

DANC309 Choreography III: Dance Composition (3 Credits)
Exploration of the structural elements of dance composition.
Prerequisite: DANC207.
Restriction: Permission of ARHU-Dance department.
Repeatable to: 6 credits if content differs.
Credit Only Granted for: DANC209 or DANC309.
Formerly: DANC209.

DANC318 Modern Dance III (3 Credits)
Continuation of the elements addressed in DANC219 with an added focus on off-verticality, spirals, complex level changes, more complex and extended phrasing, responsiveness to accompaniment, vocalization.
Prerequisite: DANC219.
Restriction: Permission of ARHU-Dance department.
Repeatable to: 6 credits if content differs.

DANC319 Modern Dance IV (3 Credits)
Continuation of the elements addressed in DANC318 with an added focus on movement subtlety and complexity, and stylistic demands.
Prerequisite: DANC318.
Restriction: Permission of ARHU-Dance department.
Repeatable to: 6 credits if content differs.

DANC328 Ballet III (2 Credits)
Execution of the vocabulary of ballet movement with technical accuracy.
Restriction: Permission of ARHU-School of Theatre, Dance & Performance Studies department.
Repeatable to: 4 credits.

DANC329 Ballet IV (2 Credits)
Continuation of DANC328.
Restriction: Permission of ARHU-School of Theatre, Dance & Performance Studies department.
Repeatable to: 4 credits.

DANC330 Hip Hop History & Culture (3 Credits)
Places the rich movement history of hip hop in a larger cultural context. Students will be exposed to the elements of hip hop culture, including graffiti, emceeing and deejaying, in relationship to various urban dance forms influenced by the hip hop movement. Additionally, students will explore hip hop's international presence, theorize its future and create self-choreographed routines.

DANC338 Dance Techniques (2 Credits)
Intermediate/Advanced level physical practice that sources a range of dance practices relevant to the current dance field in order to expose students to a plurality of techniques as a form of inclusive investigation.
Restriction: Permission of ARHU-School of Theatre, Dance & Performance Studies department.
Repeatable to: 6 credits if content differs.

DANC348 Modern Dance III (3 Credits)
The body as an instrument of expression; techniques for increasing kinesthetic sensitivity.
Prerequisite: DANC249; and permission of ARHU-School of Theatre, Dance & Performance Studies department.
Repeatable to: 6 credits.

DANC349 Modern Dance IV (3 Credits)
Continuation of DANC348.
Prerequisite: DANC348; and permission of ARHU-School of Theatre, Dance & Performance Studies department.
Repeatable to: 6 credits.

DANC369 Special Topics in Study Abroad III (1-6 Credits)
Special topics course taken as part of an approved study abroad program.
Repeatable to: 15 credits if content differs.

DANC371 Somatics (3 Credits)
Current ideas and trends in dance technique, with a focus on the incorporation of dance science and somatics into dance training.
Prerequisite: DANC179.
Restriction: Permission of ARHU-Dance department.

DANC379 Practicum in Dance (1-3 Credits)
Performing experience for the student dancer who has developed a professional level of competence.
Repeatable to: 12 credits.

DANC383 Dance History & Theory (3 Credits)
With a primary focus on Western concert dance from the 20th and 21st centuries, this course proposes an understanding of dance as it is situated in historical and cultural contexts. Rather than proposing a canon of "masterworks", this course interrogates choreography and other dance practices from multiple perspectives such as feminist theories, race, gender, and sexuality studies.
Restriction: Permission of ARHU-Dance department.
Credit Only Granted for: DANC283 or DANC383.
Formerly: DANC283.

DANC386 Experiential Learning (3-6 Credits)
Restriction: Junior standing or higher; and permission of ARHU-School of Theatre, Dance & Performance Studies department.

DANC398 Directed Studies in Dance (1-6 Credits)
Restriction: Permission of ARHU-School of Theatre, Dance & Performance Studies department.
Repeatable to: 6 credits.

DANC399 Practicum in Choreography, Production and Performance III (1-3 Credits)
Continuation of DANC299.
Prerequisite: DANC299; and permission of ARHU-School of Theatre, Dance & Performance Studies department.
Repeatable to: 6 credits.

DANC405 Dance Education II: Education & Policy (3 Credits)
Curricula in dance in K-12 settings, classroom management, assessment/grading, and best practices in dance education in public schools. Current research and policy issues are included. This course counts towards teacher certification in the State of Maryland.
Restriction: Permission of ARHU-Dance department.

DANC409 Contact Improvisation (2 Credits)
Discovery and cultivation of the principles and skills of Contact Improvisation dance technique.
Restriction: Permission of ARHU-School of Theatre, Dance & Performance Studies department.
Repeatable to: 4 credits.
Credit Only Granted for: DANC489C or DANC409.

DANC418 Contemporary Modern (2 Credits)
Physical practice that sources postmodern dance influences, endurance training, improvisation, and choreographic composition to present movement practices as a form of investigation.
Prerequisite: DANC218; or permission of instructor.
Repeatable to: 6 credits.
Credit Only Granted for: DANC418 or DANC489O.
Formerly: DANC489O.

DANC420 Partnering (2 Credits)
Elements of contemporary partnering including weight sharing, counter balancing, momentum/leverage, lifting and moving responsively.
Restriction: Permission of ARHU-Dance department.

DANC429 Advanced Ballet Technique II (1 Credit)
Intensive work in ballet technique for the professionally-oriented dancer.
Restriction: Permission of ARHU-School of Theatre, Dance & Performance Studies department.
Repeatable to: 3 credits.

DANC448 Modern Dance V (3 Credits)
Complex phrases of modern dance movement with emphasis on articulation and expression.
Prerequisite: DANC349; and must audition.
Repeatable to: 6 credits.

DANC449 Modern Dance VI (3 Credits)
Continuation of DANC448.
Prerequisite: DANC448; and permission of ARHU-School of Theatre, Dance & Performance Studies department.
Repeatable to: 6 credits.

DANC466 Laban Movement Analysis (3 Credits)
Introduction to Rudolf Laban's system of qualitative movement analysis in relation to understanding personal movement style. Application to dance performance, teaching, composition and research.

DANC468 Dance Repertory (3 Credits)
Form, content, music, design and performance of modern dance works.
Prerequisite: DANC349; and permission of ARHU-School of Theatre, Dance & Performance Studies department.
Repeatable to: 6 credits if content differs.

DANC469 Study Abroad Special Topics IV (1-6 Credits)
Special topics course taken as part of an approved study abroad program.
Repeatable to: 15 credits if content differs.

DANC479 Advanced Practicum in Dance (1-3 Credits)
Advanced level performing experience for the student dancer who has developed an advanced professional level of competence.
Repeatable to: 6 credits.

DANC485 Seminar in Dance (3 Credits)
Individual research leading to a presentation with written documentation of the process, serving as a culmination of undergraduate study for dance majors.
Prerequisite: DANC483.
Restriction: Must be in Dance program; and senior standing.

DANC488 Project-Based Learning (3 Credits)
A specific project, is addressed, in dance from the perspectives of the investigator, the creator/choreographer, and the performer. Projects are cross-disciplinary and/or cross-cultural, and may involve both on- and off-campus experiences.
Restriction: Permission of ARHU-Dance department.
Repeatable to: 6 credits if content differs.

DANC489 Special Topics in Dance (1-3 Credits)
Theoretical, choreographic, pedagogic, or performance study.
Restriction: Permission of ARHU-School of Theatre, Dance & Performance Studies department.
Repeatable to: 6 credits if content differs.

DANC499 Practicum in Choreography, Production and Performance IV (1-6 Credits)
Advanced workshop in dance presentation, including performing, production and planned field experiences.
Restriction: Permission of ARHU-School of Theatre, Dance & Performance Studies department.
Repeatable to: 6 credits.

DATA - Data Science and Analytics

DATA100 Elementary Statistics and Probability (3 Credits)
Simplest tests of statistical hypotheses; applications to before-and-after and matched pair studies. Events, probability, combinations, independence. Binomial probabilities, confidence limits. Random variables, expected values, median, variance. Tests based on ranks. Law of large numbers, normal approximation. Estimates of mean and variance.
Prerequisite: MATH107, MATH113, or MATH115 with a C- or better; or permission of CMNS-Mathematics department; or must have math eligibility of STAT100 or higher and math eligibility is based on the Math Placement Exam or the successful completion of Math 003 with appropriate eligibility.
Cross-listed with: STAT100.
Restriction: Must not have completed MATH111; or must not have completed any STAT course with a prerequisite of MATH141.
Credit Only Granted for: DATA100 or STAT100.

DATA110 Applications of R for Data Science (1 Credit)
Intended to prepare students for subsequent courses requiring computation with R, providing powerful and easy to use tools for statistical data analysis. Covers basics of R and R Studio including file handling, data simulation, graphical displays, vector and function operations, probability distributions, and inferential techniques for data analysis.
Prerequisite: DATA100, STAT100, MATH135, or any 400-level STAT course.
Cross-listed with: STAT110.
Credit Only Granted for: STAT110 or DATA110.

DATA120 Python Programming for Data Science (1 Credit)
An introduction to programming in Python language, using Jupyter Notebooks and Python scripts. Covers variables, conditionals, loops, functions, lists, strings, tuples, sets, dictionaries, files and visualization.
Prerequisite: DATA100, STAT100, MATH135, or any 400-level STAT course.

DATA200 Knowledge in Society: Science, Data and Ethics (3 Credits)
An introduction to the fundamental concepts and principles that govern ethical data collection, analysis, and usage. Students will explore various methods of data collection and gain an understanding of the ethical implications associated with each approach. Key topics include data ownership, data privacy, data anonymity, and data validity, providing students with a solid foundation in ethical data practices.
Prerequisite: DATA100, STAT100, MATH135, or any 400-level STAT course.

DATA250 Discrete Mathematics (4 Credits)
Introduction to basic discrete mathematical and linear algebraic structures and use of these mathematical structures to solve programming problems. Logic, set theory, formal proof methodology, functions, combinatorics, advanced counting techniques, and elements of linear algebra.
Prerequisite: DATA110 or DATA120; and MATH141.

DATA320 Introduction to Data Science (3 Credits)
An introduction to data science i.e., the end-to-end process of going from unstructured, messy data to knowledge and actionable insights. Provides a broad overview of several topics including statistical data analysis, basic data mining and machine learning algorithms, large-scale data management, cloud computing, and information visualization.
Prerequisite: DATA110 or DATA120; and DATA200 and DATA250; or by permission of the DATA Program Director.
Jointly offered with: CMSC320.
Restriction: Must not be a Computer Science major.
Credit Only Granted for: CMSC320 or DATA320.

DATA350 Data Visualization and Presentation (3 Credits)
Introduction to effective and intuitive visual representations of data, including customizing graphics, plotting arrays, statistical graphics, and representing time series.
Prerequisite: DATA100, STAT100, MATH135, or any 400 level STAT course; and DATA110 or DATA120.

DATA400 Applied Probability and Statistics I (3 Credits)
Random variables, standard distributions, moments, law of large numbers and central limit theorem. Sampling methods, estimation of parameters, testing of hypotheses.
Prerequisite: 1 course with a minimum grade of C- from (MATH131, MATH141); or students who have taken courses with comparable content may contact the department.
Cross-listed with: STAT400.
Credit Only Granted for: DATA400, ENEE324, or STAT400.
Additional Information: Not acceptable toward graduate degrees in MATH/STAT/AMSC.

EALL - East Asian Languages and Literatures

EALL269 Special Topics in Study Abroad II (1-6 Credits)
Special topics course taken as part of an approved study abroad program.
Repeatable to: 15 credits if content differs.

EALL300 The Languages of East Asia (3 Credits)
A survey of Chinese, Japanese, and Korean, and the languages of other East Asian nationalities. Provides a basic understanding of the structures of these languages. Topics covered include the characterizing features; the relationships of the languages to each other; the geographical, social, and historical settings. No knowledge of Asian languages is required. Taught in English.

EALL369 Special Topics in Study Abroad III (1-6 Credits)
Special topics course taken as part of an approved study abroad program.
Repeatable to: 15 credits if content differs.

ECON - Economics

ECON111 Thinking Like an Economist (3 Credits)
An introduction to the modes of thought of economics. Use of simple standard tools of economics to analyze important problems that arise frequently in public policy, the news media, and in daily life. An emphasis on how economists predict what choices societies make and how economists analyze whether those are good choices. Practical application of a variety of economic tools leading to a focus on the essential unity underlying these analytical tools, viewing economics as a discipline that applies a core methodology in different ways in different situations.
Restriction: Must be sophomore standing or lower.

ECON175 Inequality: Determinants and Policy Remedies (3 Credits)
History shows that the gap between the rich and the poor has varied over time within and between countries, most recently seeming to increase within many countries while somewhat decreasing between countries. This course challenges students to investigate why people make different amounts of money, why income inequality has changed dramatically in recent years, what public policy tools exist to counter inequality increases, and what different institutional arrangements different countries use to lower inequality. This course will introduce students to theoretical tools used by economists to understand the sources of inequality and will also examine various empirical measures of inequality.

ECON181 Putting a Price on the Environment: An Economist's Perspective on Sustainability (3 Credits)
How does society balance the benefits of environmental protection and preservation against the costs? Though some might say that the environment is priceless, economists recognize that every action involves trade-offs. This course investigates sustainability through comparing costs and benefits. From this perspective, other questions arise: How can we design policies that incentivize sustainable choices? Why might usual market functioning fail to achieve sustainability? Do we need to put a price on the environment in order to protect it? How do we measure an economy's "success"? This course explores the answers to these and other related questions from an economist's perspective.

ECON185 Energy: Crisis or Breakthrough? (3 Credits)
Will we face an energy crisis in the near future, or will technological breakthroughs solve problems? Will we destroy the environment by careless use of polluting energy, or we will find new and clean sources of energy that resolves the environmental issue once and for all? Will politicians and governments succeed in agreeing on a coherent strategy to deal with global issues related to energy, or do we expect individual countries to move in different directions and exacerbate the problems? Students will explore the demand and supply sides of the energy market and their relationships with government policies and environmental concerns. Students will also analyze empirical evidence to better understand the factors affecting energy production and consumption in the past and possible directions in the future. By examining past situations when technological change mitigated problems in energy markets, we can make informed predictions about what could happen next.

ECON200 Principles of Microeconomics (3 Credits)
Introduces economic models used to analyze economic behavior by individuals and firms and consequent market outcomes. Applies conceptual analysis to several policy issues and surveys a variety of specific topics within the broad scope of microeconomics.
Prerequisite: MATH107 or MATH110; or must have math eligibility of MATH113 or higher.
Additional Information: It is recommended that students complete ECON200 before taking ECON201.

ECON201 Principles of Macroeconomics (3 Credits)
An introduction to how market economies behave at the aggregate level. The determination of national income/output and the problems of unemployment inflation, will be examined, along with monetary and fiscal policy.
Prerequisite: MATH107 or MATH110; or must have math eligibility of MATH113 or higher.
Recommended: ECON200.
Credit Only Granted for: ECON201 or ECON205.

ECON230 Applied Economic Statistics (3 Credits)
Introductory course to develop understanding of statistical concepts used in applied economics. Students will acquire skills needed to calculate and interpret statistical concepts, including descriptive statistics, probability, discrete and continuous distributions, sampling, point and interval estimations, hypothesis testing, basic analysis of variance, and simple linear regression models. Students will apply these concepts to data using both handheld calculators and spreadsheets(Excel), and students will be introduced to an econometric software package such as SPSS or SAS or R.
Prerequisite: Must have math eligibility of MATH113 or higher; or 1 course with a minimum grade of C- from (MATH107, MATH110); and minimum grade of C- in ECON200 and ECON201.
Recommended: Students should already have basic familiarity with Microsoft Excel or similar spreadsheet software.
Restriction: Must be in one of the following programs (Economics Bachelor of Arts; Economics minor; Social Data Science-Economics).

ECON258 Special Topics in Study Abroad II (1-6 Credits)
Special topics course taken as part of an approved study abroad program.
Repeatable to: 15 credits if content differs.

ECON298 Special Topics in Economics (3 Credits)
Selected topics in economics. Designed to meet the changing interests of students and staff.
Repeatable to: 6 credits if content differs.

ECON300 Methods and Tools for Economic Analysis (3 Credits)
Economic application of mathematical tools and concepts necessary for intermediate and advanced coursework in economics. Topics include: multivariable calculus, constrained optimization, foundational coverage of probability theory, and exponential/logarithmic functions.
Prerequisite: 1 course with a minimum grade of C- from (ECON200, ECON201); and minimum grade of C- in MATH140.
Restriction: Must be in Economics Bachelor of Science program; and must not have completed MATH241.

ECON305 Intermediate Macroeconomic Theory and Policy (4 Credits)
Analysis of the determination of national income, employment, and price levels. Discussion of consumption, investment, inflation, and government fiscal and monetary policy.
Prerequisite: Minimum grade of C- in ECON200 and ECON201; and 1 course with a minimum grade of C- from (MATH120, MATH130, MATH136, MATH140).
Credit Only Granted for: ECON305 or ECON325.

ECON306 Intermediate Microeconomic Theory & Policy (4 Credits)
Analysis of the theories of consumer behavior, producer behavior, different market structures, and various sources of inefficient outcomes. Analysis of microeconomic policies designed to improve market outcomes.
Prerequisite: Minimum grade of C- in ECON200 and ECON201; and 1 course with a minimum grade of C- from (MATH120, MATH130, MATH136, MATH140).
Credit Only Granted for: ECON306, ECON326, AREC489M, or AREC326.

ECON310 European Economic History (3 Credits)
The evolution of the capitalist system from its medieval origins to the present. Emphasis on dynamic forces of cumulative change in capitalism, including capital accumulation, technology, expansion of markets, the corporate form of private property in the means of production, and the relation of capitalism to war and revolution.
Prerequisite: Minimum grade of C- in ECON200 and ECON201.

ECON311 American Economic History Before the Civil War (3 Credits)
Economic concepts are used to analyze various aspects of the founding and early history of the U.S., including the British settlement of the North American colonies, the economics of the American Revolutionary war, the writing of the Constitution, the development of financial markets, policies on public lands and the spread of western agriculture, slavery, banking, and early industrialization.
Prerequisite: Minimum grade of C- in ECON200 and ECON201.
Restriction: Must be in one of the following programs (Economics Bachelor of Arts; Economics minor; Social Data Science-Economics).

ECON312 American Economic History After the Civil War (3 Credits)
Topics include: the economics of the Civil War, the performance of southern agriculture in the late 19th century, the rise of large corporations, industrialization, the development of financial markets, the creation of the Federal Reserve Board, the economics of the Great Depression and the New Deal, the economic impact of World War II, and the rise of the modern service economy in the late 20th century. Utilizes basic economic theories to understand these episodes as well as the progress of the U.S. economy over this period.
Prerequisite: Minimum grade of C- in ECON200 and ECON201.
Restriction: Must be in one of the following programs (Economics Bachelor of Arts; Economics minor; Social Data Science-Economics).

ECON314 Economic History, Development and Policy (3 Credits)
Study abroad in the economic history, institutional development, and recent economic policy problems of selected areas.
Prerequisite: ECON200 and ECON201.

ECON315 Economic Development of Underdeveloped Areas (3 Credits)
Analysis of the economic and social characteristics of underdeveloped areas. Recent theories of economic development, obstacles to development, policies and planning for development.
Prerequisite: Minimum grade of C- in ECON200 and ECON201.
Credit Only Granted for: ECON315 or ECON416.

ECON317 Global Economic Policies (3 Credits)
Analysis of policy options and debates on fostering economic growth and development in a global economy where national boundaries are no longer relevant. Topics covered will include real loanable funds markets in both local and international contexts during normal conditions and during financial crises, the design of trade and industrial policies, and the role of the World Bank, IMF, WTO, and other international agencies as well as regional and bilateral trade agreements. Emerging economies will be emphasized.
Prerequisite: Minimum grade of C- in ECON200 and ECON201.
Restriction: Must be in one of the following programs (Economics Bachelor of Arts; Economics minor; Social Data Science-Economics).

ECON321 Economic Statistics (3 Credits)
Introduction to the use of statistics in economics. Topics include: Probability, random variables and their distributions, sampling theory, estimation, hypothesis testing, analysis of variance, regression analysis and correlation.
Prerequisite: Minimum grade of C- in ECON200 and ECON201; and minimum grade of C- in ECON300 or (MATH241 and any statistics course).
Restriction: Must be in Economics Bachelor of Science program.

ECON325 Intermediate Macroeconomic Analysis (4 Credits)
Analysis of macroeconomic behavior and policy with emphasis on theoretical rigor. Topics include the determinants of economic growth, unemployment, inflation, and international economic flows.
Prerequisite: Minimum grade of C- in ECON200 and ECON201; and minimum grade of C- in ECON300 or (MATH241 and any statistics course).
Restriction: Must be in one of the following programs (Economics Bachelor of Science; Economics minor).
Credit Only Granted for: ECON305 or ECON325.

ECON326 Intermediate Microeconomic Analysis (4 Credits)
Analysis of economic decision-making by individuals and firms, the resulting market outcomes, and applications to real-world problems. Emphasis on analytical logic and theoretical rigor. Topics covered include consumer preferences and utility maximization, perfect competition and market power, uncertainty and risk, externalities, and asymmetric information.
Prerequisite: Minimum grade of C- in ECON200 and ECON201; and minimum grade of C- in ECON300 or (MATH241 and any statistics course).
Restriction: Must be in one of the following programs (Economics Bachelor of Science; Economics minor).
Credit Only Granted for: ECON306, ECON326, or AREC326.

ECON327 Behavioral Economics (3 Credits)
Integrating the insights of psychology into economics. Analysis of the ways in which individuals make decisions that systematically depart from the so-called "standard model" of homo economicus, which assumes perfect rationality, perfect selfishness, and perfect willpower. Investigating the implications of the major findings of behavioral economics for policymakers.
Prerequisite: Minimum grade of C- in ECON200 and ECON201.
Restriction: Must be in one of the following programs (Economics Bachelor of Arts; Economics minor; Social Data Science-Economics).

ECON330 Money and Banking (3 Credits)
The structure of financial institutions and their role in the provision of money and near money. Analysis of the Federal Reserve System, the techniques of central banks, and the control of supply of financial assets in stabilization policy. Relationship of money and credit to economic activity and the price level.
Prerequisite: Minimum grade of C- in ECON200 and ECON201.

ECON340 International Economics (3 Credits)
Introduces economic models of international trade and finance. Analyzes policies designed to promote and restrict international trade and to manage exchange rates and impact international capital flows.
Prerequisite: Minimum grade of C- in ECON200 and ECON201.
Credit Only Granted for: ECON340 or ECON441.

ECON354 Using Big Data to Solve Economic and Social Problems (4 Credits)
Shows how "big data" can be used to understand and address some of the most important social and economic problems of our time. The course will give students an introduction to frontier research and policy applications in economics and social science in a less-technical manner. Topics include equality of opportunity, education, racial disparities, innovation and entrepreneurship, health care, climate change, criminal justice, and tax policy. In the context of these topics, the course will also provide an introduction to basic methods in data science, including regression, causal inference, and machine learning.
Prerequisite: Minimum grade of C- in ECON200 and ECON201; and 1 course with a minimum grade of C- from (ECON230, BMGT230, ECON321, STAT401).
Restriction: Must be in one of the following programs (Economics Bachelor of Arts; Economics Bachelor of Science; Economics minor; Social Data Science-Economics).

ECON358 Special Topics in Study Abroad III (1-6 Credits)
Special topics course taken as part of an approved study abroad program.
Prerequisite: At least one principles level course.
Repeatable to: 15 credits if content differs.

ECON371 Economic Analysis of Good, Evil, and Fairness (3 Credits)
Examines how economic tools can be used to analyze and better understand issues of "Good", "Evil" and "Fairness". Considers questions such as: What is the relation between fairness and equal treatment? Between fairness and equality? What makes an economic or political system "fair" or "unfair"? What makes a system "good"?
Prerequisite: Minimum grade of C- in ECON200 and ECON201.
Restriction: Must be in one of the following programs (Economics Bachelor of Arts; Economics minor; Social Data Science-Economics).

ECON375 Economics of Poverty and Discrimination (3 Credits)
Examination of various issues, including: the causes of persistent poverty over time for some groups within society; the relationship of poverty to technological change, to economic growth, and to education and training; economic results of discrimination; proposed remedies for poverty and discrimination.
Prerequisite: Minimum grade of C- in ECON200 and ECON201.

ECON386 Experiential Learning (3 Credits)
See Department Advising Office for course eligibility, course requirements, and application information.
Prerequisite: ECON201 and ECON200.
Restriction: Permission of BSOS-Economics department; and must be in a major within the BSOS-Economics department; and minimum cumulative GPA of 2.5; and junior standing or higher.

ECON387 Career Preparation for Economics Majors (2 Credits)
Increase student knowledge of career paths, job search tools, and strategies for successfully obtaining a job with a BA or BS in economics. Students will engage in a range of different activities which build their understanding of job opportunities in economics and hone their abilities to find positions they want. Students will reflect on specific skills employers seek from economics graduates and incorporate that knowledge in their own individual job search and career plan.
Prerequisite: Minimum grade of C- in ECON200 and ECON201.
Restriction: Must be in one of the following programs (Economics Bachelor of Arts; Economics Bachelor of Science) ; and must have earned a minimum of 30 credits.

ECON396 Independent Honors Study (3 Credits)
First semester of the departmental honors sequence. Students will develop and apply research skills required to carry out original research. By the end of the semester students will have produced a complete draft of an honors thesis resembling a scholarly journal article.
Restriction: Permission of BSOS-Economics department.

ECON397 Honors Thesis (3 Credits)
General supervision will be provided through assembled meetings with the professor in charge of the course.
Prerequisite: ECON396.
Restriction: Must be a candidate for honors in economics.

ECON398 Topics in Economics (3 Credits)
This course is designed to meet the changing interests of students and staff. Topics vary in response to those interests. Students are advised to seek information about the coverage and prerequisites during the registration period.
Prerequisite: ECON201 and ECON200.
Restriction: Permission of BSOS-Economics department.
Repeatable to: 6 credits if content differs.

ECON399 Independent Study in Economics (1-3 Credits)
Integrated readings and independent study under direction and supervision of a faculty member. Contact department for additional information.
Prerequisite: Minimum grade of C- in ECON200 and ECON201.
Restriction: Permission of BSOS-Economics department.
Repeatable to: 6 credits if content differs.

ECON401 Current Issues in American Economic Policy (3 Credits)
Analysis of current economic problems and public policies. Topics could include poverty, income inequality, social insurance, education, environmental sustainability, immigration, and innovation. Other issues may be substituted depending on current events.
Prerequisite: 1 course with a minimum grade of C- from (ECON305, ECON325); and 1 course with a minimum grade of C- from (ECON306, ECON326); and 1 course with a minimum grade of C- from (ECON424, ECON422).
Restriction: Permission of BSOS-Economics department; and must be in one of the following programs (Economics Bachelor of Arts; Economics minor; Social Data Science-Economics).

ECON402 Macroeconomic Models and Forecasting (3 Credits)
Analysis of the fluctuations in economic activity and the formulation and use of forecasting models of the economy. Illustrations of computer macro models and forecasting problems.
Prerequisite: 1 course with a minimum grade of C- from (ECON305, ECON325); and 1 course with a minimum grade of C- from (ECON230, BMGT230, ECON321).
Restriction: Must be in one of the following programs (Economics Bachelor of Arts; Economics minor; Social Data Science-Economics).

ECON406 Advanced Microeconomics (3 Credits)
Expands on the assumptions of rational decision-making used in intermediate microeconomics and develops more complicated, more realistic models which address uncertainty, intertemporal choices, strategic interactions, social preferences and considerations of what is fair.
Prerequisite: Minimum grade of C- in ECON326; and 1 course with a minimum grade of C- from (ECON321, STAT401).
Restriction: Must be in one of the following programs (Economics Bachelor of Science; Economics minor).

ECON407 Advanced Macroeconomics (3 Credits)
An in-depth analysis of current issues in macroeconomic theory and policy. Topics covered include: 1. alternative perspectives on macroeconomics including monetarism, new classical equilibrium models, rational expectations, and real business cycle models; 2. long term growth, the slowdown in productivity growth, and concerns about U.S. competitiveness; 3. the effectiveness of macroeconomic policy in an open economy; 4. the effects of finance on the real sector.
Prerequisite: Minimum grade of C- in ECON325; and 1 course with a minimum grade of C- from (ECON321, STAT401).
Restriction: Must be in one of the following programs (Economics Bachelor of Science; Economics minor).

ECON410 Comparative Economic Institutions (3 Credits)
Institutions are the sets of rules that constrain the decisions and interactions of economic agents. The course uses economic analysis to understand both formal institutions (e.g. laws) and informal institutions (e.g. cultural norms). Practical examples are drawn from economics, law, and politics, and reflect the experience of many different countries.
Prerequisite: Minimum grade of C- in ECON325 and ECON326; and 1 course with a minimum grade of C- from (ECON321, STAT401).
Restriction: Must be in one of the following programs (Economics Bachelor of Science; Economics minor).

ECON412 Economic History and Modern Development (3 Credits)
Analysis of major economic, political, and social change in the developed world since 1800. This includes factors contributing to increases in economic performance, changes in the form of government, technological change (including industrialization), and integration and disintegration of the global economy. Emphasis is on institutional changes in how societies organize economic and political activities.
Prerequisite: Minimum grade of C- in ECON325 and ECON326.
Restriction: Must be in one of the following programs (Economics Bachelor of Science; Economics minor).

ECON414 Game Theory (3 Credits)
Studies the competitive and cooperative behavior that results when several parties find that their individual outcomes are jointly determined. Students will learn how to use game theory to analyze situations of potential conflict. Applications are drawn from economics, business, and political science.
Prerequisite: 1 course with a minimum grade of C- from (ECON306, ECON326); and 1 course with a minimum grade of C- from (ECON230, BMGT230, ECON321, STAT401).
Restriction: Must be in one of the following programs (Economics Bachelor of Arts; Economics Bachelor of Science; Economics minor).
Credit Only Granted for: CMSC474, ECON414, GVPT399A or GVPT390.

ECON415 Market Design (3 Credits)
Focuses on recent developments in the design of markets to improve economic performance and to open new economic opportunities. It is divided into three main segments -- auction design, the design of matching mechanisms, and antitrust theory and policy.
Prerequisite: Minimum grade of C- in ECON414.
Restriction: Must be in one of the following programs (Economics Bachelor of Science; Economics minor).

ECON416 Analysis of Economic Development (3 Credits)
Analysis of the determinants and influences on economic development. Emphasis on both theoretical models and econometric methods of explaining why some countries are poor, along with examination of policies to promote development.
Prerequisite: Minimum grade of C- in ECON325, ECON326, and ECON422.
Restriction: Must be in one of the following programs (Economics Bachelor of Science; Economics minor).
Credit Only Granted for: ECON315 or ECON416.

ECON417 Estimating Policy and Program Impact (3 Credits)
Governments, businesses, non-profits, funders, and other organizations must allocate scarce resources between competing uses. Understanding the causal effect of policies, programs or investments on key outcomes can guide the choices of these decision-makers. Correlations between policies and outcomes or changes in outcomes after new policies are adopted are rarely sufficient for estimating the causal effect, however. This course focuses on econometric strategies for obtaining unbiased causal estimates, including experimental methods, instrumental variables, regression discontinuity, and differences-in-differences. There will be an emphasis on using Stata and on interpreting the results of econometric analysis
Prerequisite: 1 course with a minimum grade of C- from (ECON306, ECON326) and 1 course with a minimum grade of C- from (ECON424, ECON422).
Restriction: Permission of BSOS-Economics department; and must be in one of the following programs (Economics Bachelor of Arts; Economics Bachelor of Science; Economics minor; Social Data Science-Economics).

ECON418 Economic Development of Selected Areas (3 Credits)
Economic and institutional characteristics of a specific geographic area are identified and discussed, and alternate strategies and policies for development are analyzed.
Prerequisite: 1 course with a minimum grade of C- from (ECON305, ECON306, ECON325, ECON326); and 1 course with a minimum grade of C- from (ECON230, BMGT230, ECON321).
Restriction: Must be in one of the following programs (Economics Bachelor of Arts; Economics minor; Social Data Science-Economics).
Repeatable to: 6 credits if content differs.

ECON422 Econometrics (3 Credits)
Emphasizes the interaction between economic problems and the assumptions employed in statistical theory. Formulation, estimation, and testing of economic models, including single variable and multiple variable regression techniques, theory of identification, and issues relating to inference.
Prerequisite: 1 course with a minimum grade of C- from (ECON325, ECON326); and 1 course with a minimum grade of C- from (ECON321, STAT401).
Restriction: Must be in one of the following programs (Economics Bachelor of Science; Economics minor).
Credit Only Granted for: ECON422, ECON424, or AREC422.

ECON423 Advanced Topics in Econometrics (3 Credits)
Interaction between economic problems and specification and estimation of econometric models. Topics may include: autocorrelation, heteroscedasticity, functional form, simultaneous equation models, logit and probit models, instrumental variables, qualitative choice models, and other computational methods.
Prerequisite: Minimum grade of C- in ECON422.
Restriction: Must be in one of the following programs (Economics Bachelor of Science; Economics minor).

ECON424 Applied Econometrics (3 Credits)
Provide the knowledge and skills necessary to accomplish and utilize basic applied econometric analysis utilized by many business service providers, government agencies, and nonprofits engaged in policy analysis. Topics include simple and multiple regressions using cross section, time series, and panel data, issues of heteroskedasticity, serial correlation, and multicollinearity, models with binary dependent variable, and program evaluation. Course emphasizes application of knowledge using software packages but still covers essential theoretical background.
Prerequisite: 1 course with a minimum grade of C- from (ECON305, ECON306, ECON325, ECON326); and 1 course with a minimum grade of C- from (ECON230, BMGT230, ECON321).
Restriction: Must be in one of the following programs (Economics Bachelor of Arts; Economics minor; Social Data Science-Economics).
Credit Only Granted for: ECON422, ECON424 or AREC422.

ECON425 Mathematical Economics (3 Credits)
Covers mathematical tools and skills utilized in upper undergraduate and master's level coursework in Economics and Public Policy. Reviews calculus and math of finance and growth. Introduces techniques of optimization, linear algebra, and differential equations and connects them to micro and macro theory and applications. Topics will also include coverage of probability theory to explore how economists model uncertainty, as well as economic applications of integration.
Prerequisite: 1 course with a minimum grade of C- from (ECON305, ECON325); and 1 course with a minimum grade of C- from (ECON306, ECON326).
Restriction: Must be in one of the following programs (Economics Bachelor of Arts; Economics minor; Social Data Science-Economics).

ECON426 Economics of Cost-Benefit Analysis (3 Credits)
Study of how to use cost benefit analysis and other similar tools of applied microeconomics to conduct policy analyses. Cost-benefit analysis is an empirical method of identifying an optimal choice from a set of policy alternatives, where optimal is defined in terms of economic efficiency. Real world examples are addressed, so that students understand limitations of the methods and also interactions of economic analysis with political and administrative processes.
Prerequisite: 1 course with a minimum grade of C- from (ECON305, ECON306, ECON325, ECON326); and 1 course with a minimum grade of C- from (ECON230, BMGT230, ECON321).
Restriction: Must be in one of the following programs (Economics Bachelor of Arts; Economics minor; Social Data Science-Economics).

ECON427 Experimental Economics (3 Credits)
An introduction to the methodology of experimental economics and its application to issues such as decision-making under uncertainty, auctions, and public goods. Also an introduction to behavioral economics as a relatively new area of economic research.
Prerequisite: Minimum grade of C- in ECON326; and 1 course with a minimum grade of C- from (ECON321, STAT401).
Restriction: Must be in one of the following programs (Economics Bachelor of Science; Economics minor).

ECON432 Applied Machine Learning (4 Credits)
Offers a comprehensive examination of the concepts and techniques used in machine learning, with a specific emphasis on their applications in economics. Focuses on the practical aspects of machine learning, including the use of different methods, model selection, and performance evaluation. Students will explore both supervised and unsupervised learning techniques, such as linear and non-linear regression, k-nearest neighbors, tree-based approaches, support vector machines, neural networks, and dimensionality reduction methods. Additional advanced methods may be covered, depending on the time available. Hands-on implementation of these techniques will be conducted using the R programming language.
Prerequisite: 1 course with a minimum grade of C- from (ECON422, ECON424).
Restriction: Permission of BSOS-Economics department; and must be in one of the following programs (Economics Bachelor of Arts; Economics Bachelor of Science; Economics minor; Social Data Science-Economics).

ECON433 Economics of Big Data (4 Credits)
The importance of big data in the global economy is rising. Students will explore the definition and characteristics of big data, the impact of big data on individuals, use of big data by firms, entrepreneurs and non-profits, as well as how big data reshapes various public policies.
Prerequisite: 1 course with a minimum grade of C- from (ECON306, ECON326); and 1 course with a minimum grade of C- from (ECON230, BMGT230, ECON321, STAT401).
Restriction: Must be in one of the following programs (Economics Bachelor of Arts; Economics Bachelor of Science; Economics minor; Social Data Science-Economics).

ECON434 The Economics of Information and Uncertainty (3 Credits)
How do rational agents make decisions when faced with uncertainty? How do markets and other institutions deal with risks? How do markets behave when some actors are better informed than others? What incentives influence whether economic decision-makers hide or reveal information? Topics include the value of information, the purchase of warranties, agency problems in management, adverse selection and moral hazard in insurance, and signaling in education.
Prerequisite: 1 course with a minimum grade of C- from (ECON306, ECON326); and 1 course with a minimum grade of C- from (ECON230, BMGT230, ECON321, STAT401).
Restriction: Must be in one of the following programs (Economics Bachelor of Arts; Economics Bachelor of Science; Economics minor; Social Data Science-Economics).
Credit Only Granted for: ECON498U or ECON434.
Formerly: ECON498U.

ECON435 Financial Markets and the Macroeconomy (3 Credits)
Provides students with the necessary tools to understand financial decisions investors and firms make. The course will cover two of the main areas of financial economics: Asset pricing and corporate finance. Asset pricing topics include the valuation of bonds, stocks, derivatives, portfolio decisions, and arbitrage. Corporate finance topics include the valuation of investment projects, the cost of capital, capital structure, and financial distress.
Prerequisite: 1 course with a minimum grade of C- from (ECON305, ECON325); and 1 course with a minimum grade of C- from (ECON306, ECON326); and 1 course with a minimum grade of C- from (ECON230, BMGT230, ECON321, STAT401).
Restriction: Must be in one of the following programs (Economics Bachelor of Arts; Economics Bachelor of Science; Economics minor; Social Data Science-Economics).
Credit Only Granted for: BMGT343 or ECON435.
Additional Information: Finance majors will not receive credit for ECON435.

ECON442 Globalization and Capital Markets (3 Credits)
Uses models of open-economy macroeconomics to explain the causes and consequences of international capital flows. Analysis is made of private consumption, investment, the government sector, current accounts, the labor market, and the money and foreign exchange markets in small open economies. This framework is then used to study examples of how speculative attacks on currencies, sudden reversals of capital inflows, and the effects of the lack of credibility of economic policy affect economic development.
Prerequisite: Minimum grade of C- in ECON326 and ECON325; and 1 course with a minimum grade of C- from (ECON321, STAT401).
Restriction: Must be in one of the following programs (Economics Bachelor of Science; Economics minor); and must not have completed ECON441.
Credit Only Granted for: ECON441 or ECON442.

ECON443 International Trade and Trade Policy in the New Global Economy (3 Credits)
Examines the economics of international economic integration, including the theory of customs unions and free trade areas, the role of GATT and the WTO, changes in individual countries' foreign trade policies during the new era of globalization, the special role of multinational firms in world trade, and recent controversies about the benefits and costs of globalized trade.
Prerequisite: 1 course with a minimum grade of C- from (ECON305, ECON325); and 1 course with a minimum grade of C- from (ECON306, ECON326); and 1 course with a minimum grade of C- from (ECON230, BMGT230, ECON321).
Restriction: Must be in one of the following programs (Economics Bachelor of Arts; Economics minor; Social Data Science-Economics); and must not have completed ECON441.
Credit Only Granted for: ECON441 or ECON443.

ECON451 Public Choice (3 Credits)
Analysis of collective decision making, economic models of government, program budgeting, and policy implementation; emphasis on models of public choice and institutions which affect decision making.
Prerequisite: 1 course with a minimum grade of C- from (ECON306, ECON326); and 1 course with a minimum grade of C- from (ECON230, BMGT230, ECON321).
Restriction: Must be in one of the following programs (Economics Bachelor of Arts; Economics minor; Social Data Science-Economics).

ECON453 Natural Resources and Public Policy (3 Credits)
Rational use and reuse of natural resources. Theory, methodology, and policies concerned with the allocation of natural resources among alternative uses. Optimum state of conservation, market failure, safe minimum standard, and cost-benefit analysis.
Prerequisite: AREC326, ECON306, or ECON326; and (BMGT230 or ECON230).
Cross-listed with: AREC453.
Restriction: Must be in one of the following programs (Agricultural and Resource Economics; Agricultural and Resource Economics: Agribusiness; Agricultural and Resource Economics: Environmental and Resource Economics; Economics Bachelor of Arts; Environmental Science & Policy-Env Economics; Social Data Science-Economics; Economics minor).
Credit Only Granted for: AREC453 or ECON453.

ECON454 Public Finance and Public Policy (3 Credits)
The role of the the public sector in a market economy constitutes the over-arching topic of this course. Emphasis lies on analyzing government expenditure programs and the microeconomics of tax policy.
Prerequisite: 1 course with a minimum grade of C- from (ECON306, ECON326); and 1 course with a minimum grade of C- from (ECON230, BMGT230, ECON321 or STAT401).
Restriction: Must be in one of the following programs (Economics Bachelor of Arts; Economics Bachelor of Science; Economics minor; Social Data Science-Economics).

ECON455 Economics of Education Policy (3 Credits)
Examines the role that government plays in providing and financing education. Analyzes why people invest in education. Considers the effects of education on long-term social and economic outcomes, the behavior of institutions that produce education, and how to design and implement public policies affecting the level and distribution of educational resources. Uses microeconomic models and empirical findings to analyze current issues in education policy.
Prerequisite: 1 course with a minimum grade of C- from (ECON306, ECON326); and 1 course with a minimum grade of C- from (ECON230, BMGT230, ECON321).
Restriction: Must be in one of the following programs (Economics Bachelor of Arts; Economics minor; Social Data Science-Economics).
Credit Only Granted for: ECON468E or ECON455.
Formerly: ECON468E.

ECON456 Law and Economics (3 Credits)
Relationship of the exchange process to the system of institutions and rules that society develops to carry out economic transactions. Topics covered include: Property rights; torts, negligence, and liability; contracts and exchanges; criminal control and enforcement; equity and efficiency issues .
Prerequisite: 1 course with a minimum grade of C- from (ECON306, ECON326); and 1 course with a minimum grade of C- from (ECON230, BMGT230, ECON321).
Restriction: Must be in one of the following programs (Economics Bachelor of Arts; Economics minor; Social Data Science-Economics).

ECON458 Special Topics in Study Abroad IV (1-6 Credits)
Special topics course taken as part of an approved study abroad program.
Prerequisite: At least one intermediate theory course and/or statistics.
Repeatable to: 15 credits if content differs.

ECON460 Industrial Organization (3 Credits)
Examines different theoretical models of firm behavior in markets with varying amounts of market power. Relates theory to specific industries and examines how market structure evolves over time.
Prerequisite: Minimum grade of C- in ECON326; and 1 course with a minimum grade of C- from (ECON321, STAT401).
Restriction: Must be in one of the following programs (Economics Bachelor of Science; Economics minor).

ECON461 Economics of Regulation and Antitrust (3 Credits)
Considers government intervention in economic activity of three types: antitrust policy, regulation of natural monopolies, and health safety regulation. Covers theoretical models, real-world policy applications, and empirical studies relevant to the impact of regulation.
Prerequisite: 1 course with a minimum grade of C- from (ECON306, ECON326); and 1 course with a minimum grade of C- from (ECON230, BMGT230, ECON321).
Restriction: Must be in one of the following programs (Economics Bachelor of Arts; Economics minor; Social Data Science-Economics).

ECON465 Health Economics (3 Credits)
An examination of the structure, conduct and performance of the health care market, including a study of physician services, the pharmaceutical industry, the hospital market and health insurance. Students will analyze markets for health care and related products by examining the incentives and constraints for various participants, including individuals, family units, doctors, pharmaceutical companies, hospitals, and insurance providers. Analysis will combine both theoretical models and empirical tools.
Prerequisite: 1 course with a minimum grade of C- from (ECON306, ECON326); and 1 course with a minimum grade of C- from (ECON230, BMGT230, ECON321, STAT401).
Jointly offered with: ECON671.
Restriction: Must be in one of the following programs (Economics Bachelor of Arts; Economics Bachelor of Science; Economics minor; Social Data Science-Economics).
Credit Only Granted for: ECON465 or ECON671.

ECON468 Special Topics in Applied Economics (3 Credits)
Selected topics in applied economics. Designed to meet the changing interests of students and staff.
Prerequisite: 1 course with a minimum grade of C- from (BMGT230, ECON230); and 1 course with a minimum grade of C- from (ECON305, ECON306).
Restriction: Must be in one of the following programs (Economics Bachelor of Arts; Economics minor; Social Data Science-Economics).
Repeatable to: 15 credits if content differs.

ECON470 Labor Economics: Theory and Evidence (3 Credits)
Analysis of labor markets in theory and the real world. Topics include labor supply, labor demand, human capital, performance incentives, unemployment, discrimination, and immigration. Students will develop an understanding of how formal economic research is used to analyze U.S. labor markets and how research influences policy debates.
Prerequisite: 1 course with a minimum grade of C- from (ECON306, ECON326); and 1 course with a minimum grade of C- from (ECON230, BMGT230, ECON321, STAT401).
Restriction: Must be in one of the following programs (Economics Bachelor of Arts; Economics Bachelor of Science; Economics minor; Social Data Science-Economics).
Credit Only Granted for: ECON470 or ECON471.

ECON472 Economics of Social Safety Nets (3 Credits)
Analysis of the economic issues associated with social safety nets. Topics to be covered include the cash transfer programs for breaking the cycle of poverty, labor market policies aimed at combating unemployment, childhood interventions to improve human capital development, and the challenges faced by pension systems over the world. The approach is based on a life-cycle perspective. Evidence and experiences from developed and developing countries will covered.
Prerequisite: 1 course with a minimum grade of C- from (ECON306, ECON326); and minimum grade of C- in ECON424.
Restriction: Permission of BSOS-Economics department; and must be in one of the following programs (Economics Bachelor of Arts; Economics minor; Social Data Science-Economics).

ECON481 Environmental Economics (3 Credits)
An exploration of the use of economic incentives for protection of the environment and the determination of appropriate (or efficient) level of environmental quality. Also covers the choice of policy instruments for the attainment of environmental standards.
Prerequisite: 1 course with a minimum grade of C- from (AREC326, ECON306, ECON326); and 1 course with a minimum grade of C- from (ECON230, ECON321, BMGT230).
Cross-listed with: AREC481.
Restriction: Must be in one of the following programs (Agricultural and Resource Economics; Agricultural and Resource Economics: Agribusiness; Agricultural and Resource Economics: Environmental and Resource Economics; Economics Bachelor of Arts; Environmental Science & Policy-Env Economics; Social Data Science-Economics; Economics minor).
Credit Only Granted for: ECON481 or AREC481.

ECON484 The Economics of Climate Change (3 Credits)
The role of economics in the formation of climate policy; basic concepts of environmental economics including efficiency, externalities, and policy instruments; economic models of intertemporal decisions and decision making in the face of uncertainty. Applied economic analysis of specific issues and current policy initiatives.
Prerequisite: 1 course with a minimum grade of C- from (AREC326, ECON306, ECON326); and 1 course with a minimum grade of C- from (ECON230, ECON321, BMGT230).
Cross-listed with: AREC454.
Credit Only Granted for: AREC454 or ECON484.

ECON485 Economics of Land Use (3 Credits)
Fundamentals of location theory. Microeconomics of land use decisions, including determination of rent and hedonic pricing models. Impacts of government decisions on land use, including regulation (e.g., zoning), incentives (transferable development rights), provision of public services, and infrastructure investments. Impacts of land use on environmental quality, including issues relating to sprawl, agricultural land preservation, and other topics of special interest.
Prerequisite: 1 course with a minimum grade of C- from (AREC326, ECON306, ECON326); and 1 course with a minimum grade of C- from (ECON230, ECON321, BMGT230).
Cross-listed with: AREC455.
Credit Only Granted for: AREC455 or ECON485.

ECON486 Energy and Environmental Economics (3 Credits)
Economic theory and empirical methods are used to study problems of energy, the environment, and the economy. It examines the extraction, production, and use of energy and market institutions and regulatory approaches used to correct market failures. Topics covered include: oil and natural gas markets, management and design of electricity markets, renewable energy, non-market valuation , climate change, and transportation policies.
Prerequisite: 1 course with a minimum grade of C- from (AREC326, ECON306, ECON326); and 1 course with a minimum grade of C- from (ECON230, ECON321, BMGT230).
Cross-listed with: AREC456.
Credit Only Granted for: AREC456 or ECON486.

ECON488 Applied Research Practicum (1-3 Credits)
Students gain experience applying economic knowledge and producing research valued by businesses, non-profits, and/or government agencies. Students engage in activities similar to what an intern or entry-level employee would perform. Students work in small groups to find different kinds of data and facts, analyze and interpret this information, and use research findings to develop and present recommendations for simulated clients.
Prerequisite: 1 course with a minimum grade of B- from (BMGT230, ECON321, ECON230); and 1 course with a minimum grade of C- from (ECON305, ECON325); and 1 course with a minimum grade of C- from (ECON306, ECON326).
Recommended: ECON422, ECON402, or ECON424.
Restriction: Permission of BSOS-Economics department.
Repeatable to: 6 credits if content differs.

ECON489 Applied Economics Practicum (1-3 Credits)
Students gain experience explaining economic knowledge to people who have not studied economics. Students engage in activities preparing them for careers in banking, business consulting, financial education, wealth management, and related services.
Restriction: Permission of BSOS-Economics department.
Repeatable to: 6 credits if content differs.

ECON490 Urban & Regional Economics: Issues and Policies (3 Credits)
Exploration of urban and regional economics and policies, including economic forces leading to formation of city and regional networks. Conceptual and empirical analysis of policies affecting land use, housing, transportation and other aspects of sub-national economic development.
Prerequisite: 1 course with a minimum grade of C- from (ECON306, ECON326); and 1 course with a minimum grade of C- from (ECON321, BMGT230, ECON230).
Restriction: Must be in one of the following programs (Economics Bachelor of Arts; Economics minor; Social Data Science-Economics).
Credit Only Granted for: ECON398I or ECON490.
Formerly: ECON398I.

ECON498 Special Topics in Economic Analysis (3 Credits)
Selected topics in economic analysis. Designed to meet the changing interests of students and staff.
Prerequisite: 1 course with a minimum grade of C- from (ECON321, STAT401); and 1 course with a minimum grade of C- from (ECON325, ECON326).
Restriction: Must be in Economics Bachelor of Science program.
Repeatable to: 15 credits if content differs.

ECON499 Independent Research in Economics (1-3 Credits)
Directed research under the supervision of a faculty member. Contact department for additional information.
Prerequisite: 1 course with a minimum grade of C- from (ECON230, ECON321, BMGT230, STAT400); and 1 course with a minimum grade of C- from (ECON305, ECON325); and 1 course with a minimum grade of C- from (ECON306, ECON326); and minimum of 3 credits from ECON400-499 course range.
Restriction: Permission of BSOS-Economics department.
Repeatable to: 6 credits if content differs.

EDCI - Curriculum and Instruction

EDCI288 Special Topics in Teacher Education (1-3 Credits)
Restriction: Permission of EDUC-Teaching, Learning, Policy and Leadership department.
Repeatable to: 6 credits if content differs.

EDCI386 Experiential Learning (3-6 Credits)
Restriction: Permission of EDUC-Teaching, Learning, Policy and Leadership department; and junior standing or higher.

EDCI422 Student Teaching in Secondary Schools: Social Studies/ Geography (12 Credits)
Prerequisite: EDCI321.
Corequisite: EDCI420.

EDCI428 Field Experience in Secondary Social Studies Teaching (1 Credit)
Practical experience as an aide to a regular social studies teacher; assigned responsibilities and participation in a variety of teaching/ learning activities. Students must reserve one full day per week for internship placement.
Corequisite: EDCI427.
Restriction: Must be in Secondary Educ: Social Studies program; and minimum cumulative GPA of 2.75. Or permission of EDUC-Teaching, Learning, Policy and Leadership department.

EDCI438 Field Experience in Second Language Education (1 Credit)
Practical experience as an aide to a regular foreign language teacher; assigned responsibilities and participation in a variety of teaching/ learning activities.
Corequisite: EDCI330.
Restriction: Permission of EDUC-Teaching, Learning, Policy and Leadership department; and must be in Secondary Educ: Foreign Languages program.
Repeatable to: 3 credits if content differs.

EDCI448 Student Teaching in Secondary Schools: Theatre/English (12 Credits)
Practical experience as an aide to a regular English, speech or drama teacher; assigned responsibilities and participation in a variety of teaching/learning activities.
Prerequisite: EDCI417.
Corequisite: EDCI440.
Restriction: Must be in Secondary Educ: English Language Arts program.

EDCI497 The Study of Teaching (3 Credits)
Identification and examination of learner and teacher outcome variables related to teaching systems, methods, and processes. Methods of conducting classroom research.
Prerequisite: EDCI481.
Corequisite: EDCI489.

EDCI498 Special Problems in Teacher Education (1-6 Credits)
Individual study of approved problems.
Restriction: Must be in a major within EDUC-Teaching, Learning, Policy and Leadership department; or must be in Curriculum and Instruction (Doctoral) program; or must be in Curriculum and Instruction (Master's) program; or permission of EDUC-Teaching, Learning, Policy and Leadership department.
Repeatable to: 6 credits.

EDCI499 Workshops, Clinics, and Institutes (1-6 Credits)
The following types of educational enterprise may be scheduled under this course heading: workshops conducted by the College of Education (or developed cooperatively with other colleges and universities) and not otherwise covered in the present course listing; clinical experiences in pupil testing centers, reading clinics, speech therapy laboratories, and special education centers; institutes developed around specific topics or problems and intended for designated groups such as school superintendents, principals and supervisors.
Repeatable to: 6 credits.

EDDI - Education Dialogues

EDDI300 Intergroup Dialogue Facilitator Development & Practicum (3 Credits)
Facilitation is an artform and a science. This course is designed to introduce students to foundational dialogue facilitation skills and social justice frameworks needed to effectively facilitate group interactions across and within social differences. Students will apply the skills learned by facilitating a multi-session dialogue course with either the Common Ground or the Words of Engagement Intergroup Dialogue Program (WeIDP).
Cross-listed with: CPSP300, HONR300.
Restriction: Permission of the Counseling, Higher Education, and Special Education department.
Credit Only Granted for: WEID300, CPSP300, HONR300, or EDDI300.
Formerly: WEID300.
Additional Information: Students must be given permission to enroll and be admitted to the intergroup dialogue facilitator program.

EDCP - Education Counseling and Personnel Services

EDCP101 The Transfer Student in the University (1 Credit)
Support transfer students in making a successful transition to the University. By making students aware of themselves as learners, introducing students to campus resources, and teaching research-based learning strategies, this course empowers students to become active and effective learners.
Credit Only Granted for: EDCP108G or EDCP101.
Formerly: EDCP108G.

EDCP108 College and Career Advancement: Concepts and Skills (1 Credit)
Knowledge and skills designed to enhance college as a learning experience or preparation for life.
Repeatable to: 3 credits if content differs.

EDCP210 Peer Counseling Skills and Mental Health Advocacy (3 Credits)
Introduction to core helping skills in peer counseling settings and three predominant theoretical approaches used in the counseling field (humanistic, psychodynamic, cognitive-behavioral). The course also explores mental health stigma and advocacy. Students will build an understanding of the practical application of underlying principles and theory in counseling and the helping professions, while exploring their own, and societal, biases, assumptions, and attitudes toward mental health.
Restriction: Must not have completed EDCP310; and must not have completed PSYC433.
Credit Only Granted for: EDCP210, EDCP310, or PSYC433.

EDCP220 Introduction to Human Diversity in Social Institutions (3 Credits)
This highly-interactive format focuses on individual and social identities in the U.S., group differences and intergroup relations, systems of privilege and oppression, and advocacy for social justice. Topics will include diversity related to race, ethnicity, gender, sexual orientation, social class, (dis)ability, and religion. Course fulfills CORE requirements in diversity, social/behavioral bases, and interdisciplinary study. Some sections restricted.

EDCP230 The Science and Practice of Happiness and Psychological Well-Being (3 Credits)
An introduction to theory and research on positive psychology, subjective well-being, and the psychology of happiness. This will include examination of hedonic and eudaimonic models of well-being and sociocultural understandings of happiness, together with how it relates to health, relationships, money, religion, work, and social media. Students will also explore common misconceptions and myths about happiness and well-being and will engage in a variety of activities designed to deepen their understanding of happiness in their own lives and broader societal trends related to well-being.

EDCP298 Special Problems in Counseling and Personnel Services (1-3 Credits)
Individual instruction in special problems related to counseling, student leadership, and college student development.
Restriction: Permission of EDUC-Counseling, Higher Education and Special Education department.

EDCP325 Substance Use and Abuse in American Society (3 Credits)
Incidence, etiology, effects and management of substance use and abuse from perspective of the individual, the family, and society.

EDCP386 Experiential Learning (3-6 Credits)
Restriction: Permission of EDUC-Counseling, Higher Education and Special Education department; and sophomore standing or higher.

EDCP411 Principles of Mental Health (3 Credits)
Mechanisms involved with personal adjustment, coping skills, and the behaviors that lead to maladjustment.
Prerequisite: 9 semester hours in the behavioral sciences; or permission of Counseling, Higher Education and Special Education department.

EDCP420 Advanced Topics in Human Diversity and Advocacy (3 Credits)
This course will build upon students' knowledge of diversity in American society and will examine contemporary topics related to multiculturalism in educational and community contexts as well as strategies for advocacy in such venues.

EDCP489 Field Experiences in Counseling and Personnel Services (1-4 Credits)
Planned field experience in education-related activities. Credit not to be granted for experiences accrued prior to registration.
Restriction: Permission of EDUC-Counseling, Higher Education and Special Education department.

EDCP498 Special Problems in Counseling and Personnel Services (1-3 Credits)
Available only to major students who have formal plans for individual study of approved problems.
Prerequisite: Available only to major students who have formal plans for individual study of approved problems.
Restriction: Permission of EDUC-Counseling, Higher Education and Special Education department.

EDCP499 Workshops, Clinics, Institutes (1-6 Credits)
The following type of educational enterprise may be scheduled under this course heading: workshops conducted by the Department of Counseling and Personnel Services (or developed cooperatively with other departments, colleges and universities) and not otherwise covered in the present course listing; clinical experiences in counseling and testing centers, reading clinics, speech therapy laboratories, and special education centers; institutes developed around specific topics or problems and intended for designated groups.
Repeatable to: 6 credits.

EDHD - Education, Human Development

EDHD200 Paradigms and Perspectives in Human Development (3 Credits)
An introduction to the paradigms and perspectives that guide the study of human development across the lifespan in cognitive, social, physical and emotional domains. Topics of study include overlying principles, concepts, assumptions, theoretical frameworks, and research methods that influence ways in which development is conceptualized. The course is designed to provide insight into major questions of the day in human development and how these prevailing perspectives have evolved over time. This course will also help students understand how knowledge of theory and research is translated into practice in a variety of professional settings.
Restriction: Must have 45 or fewer credits; or must be in the Human Development program or Human Development minor.

EDHD201 Learning How to Learn (3 Credits)
Immerses students in the theoretical and empirical study of learning by engaging them in orchestrated experiences and activities drawn directly from the disciplinary research. Students achieve deep understanding of their own learning, as well as the means of enhancing that learning both in school and out-of-school contexts.

EDHD210 Foundations of Early Childhood Education (3 Credits)
Students explore historical and current research in early childhood education, primary models of curriculum and pedagogy in the field, and the relationship between critical aspects of young children's development and the creation of inclusive learning opportunities for all children, including children at risk. The concept of developmentally appropriate practice and its application across different developmental levels and early childhood classrooms will be introduced and connected with discussion in EDHD220 and EDSP211. Students examine issues in developing and implementing high quality early childhood education experiences for young children with and without disabilities, including the influence of family, culture, and community, the needs of children at risk (e.g., poverty, immigrant status, English Language Learners), and the role of assessment in early learning.
Restriction: Permission of EDUC-Human Development and Quantitative Methodology department.

EDHD220 Exploring Early Childhood General and Special Education (3 Credits)
Students who are considering a career in education will consider information about the teaching profession. Students reflect on their personal strengths, identify areas of growth, and examine their predisposition to work with young children with and without disabilities. They will discuss the nature of teaching, the moral and philosophic underpinnings that influenced their decision to enter into the teaching professions, as well as the roles and responsibilities of teachers and the characteristics and qualities for effective teachers (teaching styles and teacher's primary role in the classroom).
Restriction: Permission of EDUC-Human Development and Quantitative Methodology department.

EDHD221 Aggression and Violence in Everyday Life: Can Violence Be Prevented? (3 Credits)
History of aggression and violence in the world and in the United States. Examines the extent to which various forms are prevalent today and scientifically supported prevention strategies. Methods of studying aggression are reviewed, as are theories and methods of preventing aggression and violence.

EDHD228 Research Experiences in Human Development (3 Credits)
Provides students with hands-on participation in faculty-supervised laboratory research activities in the Department of Human Development & Quantitative Methodology. Students will learn about the purpose of scientific research and engage in activities that advance their knowledge and skills with regard to its ethical practice.
Restriction: Permission of instructor.
Repeatable to: 6 credits.

EDHD230 Human Development and Societal Institutions (3 Credits)
Development of the individual in the context of relationships with the formal and informal institutions of society. An examination of various aspects of development from the broad perspective of the social sciences.

EDHD231 Inside 21st Century Creativity: How Creative Ideas, Concepts, and Products are Generated (3 Credits)
Mechanisms of the creative mind. Psychological, social, sociological, developmental, cultural, educational, genetic and neural based roots of creativity.

EDHD241 Are Two Languages Better than One: The Science and Controversy of Bilingualism (3 Credits)
Examines the big question: Are two languages better than one? We will study the science of bilingualism: contemporary theories; research; controversies surrounding bilingual education; nature vs. nurture; first language acquisition. Additional studies cover: who is bilingual, how children become bilingual, factors that influence bilingual development, bilingual benefits and impact on brain development; bilingual education policy.

EDHD251 The Ecology of Childhood Poverty (3 Credits)
How does poverty shape the relationship between humans and their environment? It seems obvious that growing in economic disadvantage in childhood has enduring effects on development. What is less obvious is how experiencing poverty in childhood shapes relationships between children and their surroundings, including family interactions, peer relationships, adult dynamics, and the health of the community. Less clear still is the extent to which positive interactions with caretakers and social supports can protect children from potential harm as they grow up. This course focuses on the complexity of poverty as a social force and community concern. Students will investigate the nature of poverty through an interdisciplinary lens that includes social theory, developmental psychology, and empirical studies. After analyzing various approaches to the study of child poverty, students will be in a position to use research on parenting and poverty to evaluate public policy and social programs in their own backyard.
Credit Only Granted for: HNUH258B or EDHD251.
Formerly: HNUH258B.

EDHD306 Research Methods in Human Development (3 Credits)
Addresses the scientific concepts and principles central to the study of human behavior and development. Students will learn about basic research methods in studying human behavior in developmental context and will participate in experiential activities, such as conducting observations and collecting self-report data. Major themes: goals of developmental research, fundamental research designs, types of measurement, elements of good scientific writing, and ethical issues in the study of human development.

EDHD310 Your Brain on Education: The Neuroscience of Learning and Development (3 Credits)
Investigation linking research in the brain science of learning and development, including the neural basis of academic skills, to achievement, disability, and broader applications to classroom learning. This course will focus on areas of education including language (spoken and written), conceptual change, numerical/quantitative processing, and social cognition as well as burgeoning areas of neuroscientific research in general cognitive processes such as attention, memory, and executive processing. These topics will be discussed with respect to typical and atypical development with some focus on developmental disabilities including autism, specific language impairment, reading and math impairment, and attention deficit disorders among others. This course will focus on both the theoretical perspectives and pragmatic issues of how evidence regarding brain development can or may be translated into useful or misleading information for educators, professionals, and parents/guardians of our children.
Prerequisite: PSYC100.

EDHD314 Reading in the Early Childhood Classroom (3 Credits)
Early childhood students introduced to current research/methods on teaching language arts. Focus on development of linguistic and cognitive processes in emergent literacy and beginning reading and writing. Application to models for the instruction and assessment of reading/writing in preschool-aged children. Also includes material on classroom-based interventions for young children at risk of reading failure due to learning difficulties. Includes Field Experiences.
Prerequisite: EDHD210, EDHD220, and EDSP211.
Corequisite: EDHD425; and corequisite: EDHD419 or EDSP420.
Restriction: Must be enrolled in Professional Early Childhood/Early Childhood Special Education Program; and minimum cumulative GPA of 2.75.

EDHD319 Selected Topics in Human Development (3 Credits)
Selected topics in human development in relation to contemporary culture.
Repeatable to: 6 credits if content differs.

EDHD320 Human Development Through the Life Span (3 Credits)
Central concepts related to parameters of human development, individual and social, which arise throughout the life span. Continuity and change within the developing individual.

EDHD322 The Young Child as Mathematician (3 Credits)
Provides a theoretical and instructional framework for mathematics instruction in early childhood classrooms. Development of understanding of early childhood mathematics that emphasizes how and in what environment young children learn mathematics. Current thinking about both content and instructional strategies for mathematics curriculum, including identification and review of standards and expectations for learning outcomes for all children. Assessment strategies for evaluating all children will be addressed. Includes Phase 1 Field Experience.
Prerequisite: EDSP423, EDHD431, and EDSP315; and track 1: Must have completed EDSP 430, EDSP 433; OR Track 2: Must have completed EDHD415, EDHD 424.
Corequisite: EDHD323, EDSP321, EDSP417, EDHD441, EDHD442, EDHD443, and EDHD444.
Restriction: Must be in the Professional Early Childhood/Early Childhood Special Education program; and senior standing or higher; and minimum cumulative GPA of 2.75.

EDHD323 Children Study their World (3 Credits)
Provides theoretical and instructional framework for social studies instruction in inclusive early childhood classrooms. Course will reflect current thinking about content and instructional strategies for social studies curriculum; identification and review of standards/expectations for learning outcomes for all children; assessment strategies for evaluating of social studies objectives; use of data driven instruction to support all children; observation of children's understanding of their social world in field placements; opportunities to explore these understandings through interviews with children and the implementation of activities. Includes Phase 1 Field Experience.
Prerequisite: EDSP423, EDHD431, and EDSP315; and track 1: Must have completed EDSP430, EDSP433; or Track 2: Must have completed EDHD415, EDHD424.
Corequisite: EDHD322, EDSP417, EDHD441, EDHD443, EDHD442, EDHD444, and EDSP321.
Restriction: Must be in the Professional Early Childhood/Early Childhood Special Education program; and senior standing or higher; and minimum cumulative GPA of 2.75.

EDHD386 Experiential Learning (3-6 Credits)
Restriction: Permission of EDUC-Human Development and Quantitative Methodology department; and junior standing or higher.

EDHD390 Career Paths and Internship Preparation in Human Development (1 Credit)
Prepares degree candidates in Human Development for career paths in the field including initial job seeking skills, knowledge necessary for entry into various professions and preparation for the program internship requirement
Restriction: Must be in the Human Development major.

EDHD398 Internship in Human Development (3-6 Credits)
A supervised internship providing opportunities to integrate theory and practice to get hands-on applied or research experience in the field of human development.
Prerequisite: EDHD200, EDHD201, EDHD320, and EDHD390.
Restriction: Permission of EDUC-Human Development and Quantitative Methodology Department.
Repeatable to: 6 credits.

EDHD400 Introduction to Gerontology (3 Credits)
Multidisciplinary survey of the processes of aging. Physiological changes, cultural forces, and self-processes that bear on quality of life in later years. Field study of programs, institutions for elderly, individual elders, their families and care providers.

EDHD402 Social Development (3 Credits)
Social Development. Critical concepts and ideas of the study of child and adolescent social development. Focus on changes in interpersonal relationships, emotions, achievement-related behavior and competence, and functioning within the broader social context.
Recommended: EDHD411.

EDHD405 Information Weaponization: Thinking Critically in a Changing World (3 Credits)
Contemporary challenges--such as climate change, food, energy and water security, and deadly virus transmission--demand that people think critically. While many societal challenges are seriously impacting local, regional and global communities, an increasing availability of information has contributed to what many call a "Post-Truth Era." We will consider the institutional use of post-truth a form of information weaponization. This course asks how information weaponization impacts the evaluation of valid lines of evidence and explanations. How do we evaluate and what is needed to improve individuals' evaluations of claims? This course will focus on mythological and unproductive thinking, increased digital literacy, enhanced reasoning, evaluation skills, and critical thinking.
Credit Only Granted for: HNUH238Y or EDHD405.
Formerly: HNUH238Y.

EDHD411 Child Growth and Development (3 Credits)
Theoretical approaches to and empirical studies of physical, psychological and social development from conception to puberty. Implications for home, school and community.

EDHD412 Infant Development (3 Credits)
Infant development across domains, including perceptual, motor, cognitive, language, social and emotional functioning from pre-natal through third year of life.

EDHD413 Adolescent Development (3 Credits)
Adolescent development, including special problems encountered in contemporary culture. Observational component and individual case study.

EDHD414 Development of the Scientific Mind Across the Lifespan (3 Credits)
Study of the educational, cognitive, social, and cultural factors that underlie the development of the scientific mind across the lifespan.
Recommended: EDHD320.

EDHD415 Promoting the Social-Emotional Competence of Young Children in Inclusive Classrooms (3 Credits)
Teachers must have knowledge and skill regarding how to appropriately manage the classroom so that all children, those with and without disabilities, will be able to learn from their school experiences. Classroom management extends beyond responding to student misbehavior to include a comprehensive approach to addressing the social/emotional competence of typically and atypically developing children. The goal of this course is to prepare early childhood teachers who are able to sensitively, responsively, and effectively manage a classroom of young students who are typically developing and those who have disabilities. Includes Field Experience.
Prerequisite: EDHD314 and EDHD425; and (EDHD419 or EDSP420).
Corequisite: EDSP423, EDSP424, and EDHD431.
Restriction: Must be in the Professional Early Childhood/Early Childhood Special Education program; and junior standing or higher; and minimum cumulative GPA of 2.75.

EDHD420 Cognitive Development and Learning (3 Credits)
Current developmental theories of cognitive processes such as language, memory, and intelligence and how differences in cognitive level (infancy through adolescence) mediate learning of educational subject matters.
Prerequisite: EDHD320, EDHD411, PSYC341, or PSYC355; or permission of EDUC-Human Development and Quantitative Methodology department.

EDHD421 Developmental Perspectives on Peer Interactions, Relationships, and Groups (3 Credits)
Explores the historical and theoretical foundations of contemporary research on peer interactions, relationships, and groups. It examines the interplay between individual characteristics, social behaviors, and relationships, and familial and extra-familial factors with an emphasis on diversity in the peer experience across various cultural, ethnic, gender, ability, and socioeconomic contexts.
Recommended: EDHD411 and EDHD306.

EDHD424 Culture, School & Community: Contexts for Learning (PreK-3rd) (3 Credits)
Explores the development of the young child (with and without disabilities, as well as those at environmental risk) in the context of the family and community, with emphasis on the impact of state, federal and school system policy on the child's world. Course will consider issues within the family, and the wider socio-cultural ecology that relate to the child's ability to develop and learn. In addition, students will develop strategies for respectful and culturally responses approaches to actively engage families in their children's development and learning. Includes Field Experience.
Prerequisite: EDHD425 and EDHD314; and (EDHD419 or EDSP420).
Corequisite: EDSP315, EDHD431, EDHD415, and EDSP423.
Restriction: Must be in the Professional Early Childhood/Early Childhood Special Education program; and junior standing or higher; and minimum cumulative GPA of 2.75.

EDHD425 Language Development and Reading Acquisition (3 Credits)
This course focuses on young children's language development and the relationship between language and reading acquisition. Students will learn: concepts central to language development; language achievements at different ages; concepts of emergent literacy; models of reading acquisition and skilled reading.

EDHD426 Cognitive and Motivational Literacy Content (3 Credits)
Students preparing for secondary teaching will learn about the cognitive and motivational aspects of literacy and learning from text for the content areas of literature, science, history and mathematics. Different evidenced-based literacy approaches appropriate for content learning are presented. Characteristics of learning environments that enable students to engage productively with diverse texts, disciplinary tasks, and technological resources in content areas are identified.

EDHD431 Child Development and Learning, Three to Eight Years (3 Credits)
Provides a basic understanding of child development theory and research, as well as specific knowledge about the development of children during the early and middle childhood "stages," specifically from ages 3 years to 8 years. A major emphasis will be the application of theory and research from the field of educational psychology to an understanding of how young children learn and achieve academically. Because the course will address the developmental and academic functioning of children with and without disabilities, a particular focus will be on individualization.
Prerequisite: Minimum grade of C- in EDHD314 and EDHD425; and 1 course with a minimum grade of C- from (EDHD419, EDSP420).
Corequisite: EDSP423 and EDSP315; and TRACK I: Must be concurrently enrolled in EDSP430, EDSP433; or TRACK 2: Must be concurrently enrolled in EDHD415, EDHD424.

EDHD432 Internship in EC/ECSE (12 Credits)
Interns spend five days per week in the classroom/home-based setting (under the mentorship of a certified teacher) where they gradually assume full responsibility for the planning, delivery and assessment of instruction or an intervention. Track I students will have an Infant/Toddler placement with special educator, Track II students will be in a Pre-K/K or Grade 1,2,3 classroom with general or special educator (must be opposite grade level and mentor from Phase I/fall of the senior year).
Prerequisite: EDHD323, EDHD322, EDSP417, EDHD441, EDHD442, EDHD443, EDHD444, and EDSP321.
Corequisite: EDHD437.
Restriction: Must be in Early Childhood and Early Childhood Special Education program; and senior standing or higher.

EDHD434 Child Development, Birth to Three Years (3 Credits)
Designed to provide students with an understanding of child development theory and research, as well as knowledge about typical and atypical development of children from birth to three years of age. The course emphasizes learning for children with and without disabilities, and for children who are at risk due to poverty and other environmental factors. The course will introduce how children develop and the challenges they face within the domains of physical, cognitive, language, social, and emotional development, with particular attention paid to the impact of risk factors on development. Students will become familiar with delays and differences in development that may occur as the result of disability. Finally, students will learn the effects of cultural and linguistic differences on growth and development. Information about theory and research in child development for children with and without disabilities will be enhanced through a series of observational experiences, which will build upon concepts addressed during class. Includes field experiences.
Prerequisite: EDHD210, EDHD220, and EDSP211.
Corequisite: EDHD314 and EDHD425.
Cross-listed with: EDSP420.
Credit Only Granted for: EDHD419A, EDSP420 or EDHD434.
Formerly: EDHD419A.

EDHD436 Cognition and Motivation in Content Area Literacy for Middle-School Students (3 Credits)
Cognitive and motivational processes of literacy and learning from texts across subjects. Structured approaches to using reading, writing, and speaking for content learning based on approaches to knowledge, motivation, and strategies. Classroom contexts that enable middle-school students to engage with diverse texts and Internet resources are provided

EDHD437 EC/ECSE Teachers as Researchers and Reflective Practitioners (3 Credits)
Students use action research to improve instructional delivery or familial interactions in an effort to enhance the overall educational experiences/outcomes of children in classrooms or home-based contexts. Students will design and implement an action research project in an effort to meet a goal articulated in an applicable Individualized Education Plan (IEP) or Individualized Family Service Plan (IFSP) or School Improvement Plan (SIP) as the basis of their project.
Prerequisite: Minimum grade of C- in EDHD322, EDHD323, EDSP321, EDSP417, EDHD441, EDHD442, EDHD443, and EDHD444.
Corequisite: EDHD432.

EDHD440 Adult Development (3 Credits)
Major conceptual approaches to the study of adult development including physical, cognitive, social, emotional and self processes that take place within individuals as they progress from emerging adulthood through middle age.
Prerequisite: EDHD320; or permission of EDUC-Human Development and Quantitative Methodology department.
Recommended: EDHD413.

EDHD441 Data Driven Decision Making in EC/ECSE (1 Credit)
Students will be exposed to formative (e.g., classroom based, ongoing) and summative (e.g., standardized testing) assessments. Students will collect and analyze formative assessment data from their internship classrooms as the bases of planning and delivering instruction to meet the diverse needs of all learners. They will also analyze standardized assessment data to gain an understanding of measures used to determined cross-school and cross-teacher effectiveness. Includes Phase I field experience.
Prerequisite: Minimum grade of C- in EDSP423, EDHD431, and EDSP315; and TRACK I: Must have completed EDSP430 and EDSP433 or TRACK 2: Must have completed EDHD415 and EDHD424.
Corequisite: EDHD322, EDHD323, EDSP321, EDSP417, EDHD442, EDHD443, and EDHD444.

EDHD442 Interventions for Children with Behavioral Challenges (1 Credit)
Students will expand knowledge of and develop skills to address challenging behaviors in inclusive early childhood classrooms. Students examine the causes underlying challenging behaviors during the early childhood years, and identify appropriate resources and support services for working with families to develop a unified approach when responding to behavioral challenges. Includes Phase I field experience.
Prerequisite: Minimum grade of C- in EDSP423, EDHD431, and EDSP315; and TRACK I: Must have completed EDSP430 and EDSP 433; or TRACK 2: Must have completed EDHD415 and EDHD 424.
Corequisite: EDSP321, EDSP417, EDHD322, EDHD323, EDHD441, EDHD443, and EDHD444.

EDHD443 Interventions for Children with Social and Communication Challenges (1 Credit)
Students will learn about the characteristics of children with autism spectrum disorder, pervasive developmental disorder, social communication disorder, and other related challenges and will be equipped to meet the needs of this group of children in the early childhood classroom. The utilization of Universal Design for Learning (UDL), Response to Intervention (RTI) and other early childhood special education approaches, as they apply to this specific group of children, will be addressed. Interventions designed to improve the functioning of children with autism spectrum disorders and related disorders will be reviewed. Includes Phase I field experience.
Prerequisite: Minimum grade of C- in EDSP423, EDHD431, and EDSP315; and TRACK I: Must have completed EDSP430 and EDSP 433; or TRACK 2: Must have completed EDHD415 and EDHD 424.
Corequisite: EDHD322, EDSP321, EDSP417, EDHD323, EDHD441, EDHD442, and EDHD444.

EDHD444 Action Research in EC/ECSE (1 Credit)
Students will become familiar with the EC/ECSE research process, literature and how teachers use action research to improve pedagogy and the experiences of children in classrooms or home-based contexts. Students will utilize this knowledge, as well as either a goal in an Individualized Education Plan (IEP) or Individualized Family Service Plan (IFSP) or School Improvement Plan (SIP), to develop an action research study commenced during the following semester. Includes Phase I field experience.
Prerequisite: Minimum grade of C- in EDSP423, EDHD431, and EDSP315; and track 1: Must have completed EDSP430 and EDSP433; OR Track 2: Must have completed EDHD415 and EDHD424.
Corequisite: EDHD322, EDHD323, EDHD441, EDHD442, EDHD443, EDSP417, and EDSP321.

EDHD460 Educational Psychology (3 Credits)
Application of psychology to learning processes and theories. Individual differences, measurement, motivation, emotions, intelligence, attitudes, problem solving, thinking and communicating in educational settings.
Prerequisite: PSYC100; or permission of EDUC-Human Development and Quantitative Methodology department.

EDHD474 Human Development Honors Seminar (3 Credits)
This seminar will have three overarching goals: (1) expose students to fundamental research questions in human development; (2) create professional development opportunities through invited speakers and (3) communicate an understanding of diversity, equity, and inclusion in all aspects of the research process.
Restriction: Must be in the Human Development Honors program.

EDHD475 Human Development Honors Thesis Preparation Course (3 Credits)
This is an individual instruction course with the thesis faculty advisor. In this course, students will work towards writing and completing their honors thesis, which will include a review of relevant literature, the rationale for the research project, research questions, methods for data collection, analysis plan, results, and a discussion of the findings. Faculty advisors will communicate the goals of the major surrounding issues of diversity, equity, and inclusion.
Prerequisite: EDHD474.
Restriction: Must be in the Human Development Honors program.

EDHD476 Human Development Honors Thesis Research (3 Credits)
This is an individual instruction course with the thesis advisor, culminating in the presentation and defense of the student's thesis. Students will address the aspects of their research that reflect diversity, equity, and inclusion.
Prerequisite: EDHD475.
Restriction: Must be in the Human Development Honors program.

EDHD488 Special Topics in Human Development (3 Credits)
Special and intensive treatment of current topics and issues in human development.
Prerequisite: EDHD320.
Recommended: PSYC100.
Restriction: Permission of EDUC-Human Development and Quantitative Methodology department.
Repeatable to: 6 credits if content differs.

EDHD489 Field Experiences in Human Development (3-6 Credits)
Planned field experience (internship or research-based activities) related to Human Development. Credit not to be granted for experiences accrued prior to registration.
Restriction: Permission of EDUC-Human Development and Quantitative Methodology department.
Repeatable to: 6 credits.

EDHD498 Special Research Problems in Human Development (1-4 Credits)
Exploration of current research problems in the study of human development. Available only to students who have definite plans for individual study of approved research problems. Credit according to extent of work.
Restriction: Permission of EDUC-Human Development and Quantitative Methodology department.
Repeatable to: 6 credits.

EDHD499 Workshops, Clinics, and Institutes (1-6 Credits)
The following types of educational enterprise may be scheduled under this course heading: workshops conducted by the College of Education (or developed cooperatively with other colleges and universities) and not otherwise covered in the present course listing; clinical experiences in pupil-testing centers, reading clinics, speech therapy laboratories, and special education centers; institutes developed around specific topics or problems and intended for designated groups such as school superintendents, principals and supervisors.
Repeatable to: 6 credits.

EDHI - Education Leadership, Higher Ed and International Ed

EDHI288 Special Problems in Education (1-6 Credits)
Available only to freshmen and sophomore students who have definite plans for individual study of approved problems relative to their preparation for teaching.
Restriction: Permission of EDUC-Counseling, Higher Education and Special Education department; and available only to freshmen and sophomore students who have definite plans for individual study of approved problems relative to their preparation for teaching.
Formerly: EDPL288.

EDHI338 Teaching and Learning about Cultural Diversity through Intergroup Dialogue (1-3 Credits)
Engages students, from one or more cultural identity groups, in facilitated dialogue about the similarities and differences of experience that exist within a group and/or between and across groups. The goal of intergroup dialogue is for students to develop comfort with, and skill for, discourse on difficult topics toward the end of fostering positive, meaningful, and sustained cross-group relationships. Whereas in debate, students learn to listen to gain advantage, in intergroup dialogue, students learn to listen to gain understanding. In so doing, students develop increased multicultural interaction facility, heightened intergroup awareness and sensitivity, and greater commitment to civic engagement.
Prerequisite: Completion of on-line registration form.
Repeatable to: 6 credits if content differs.
Formerly: EDPL288.

EDHI488 Special Topics in Education Policy and Administration (1-3 Credits)
Special and intensive treatment of current topics and issues in education policy and administration.
Restriction: Permission of EDUC-Counseling, Higher Education and Special Education department.
Repeatable to: 6 credits.
Formerly: EDPL488.

EDHI489 Field Experiences in Education (1-4 Credits)
Planned field experience in education-related activities. Credit not to be granted for experiences accrued prior to registration.
Restriction: Permission of EDUC-Counseling, Higher Education and Special Education department.
Formerly: EDPL489.

EDHI498 Special Problems in Education (1-3 Credits)
Available only to students who have definite plans for individual study of approved problems.
Prerequisite: Available only to students who have definite plans for individual study of approved problems.
Restriction: Permission of EDUC-Counseling, Higher Education and Special Education department.
Formerly: EDPL498.

EDHI499 Workshops, Clinics, and Institutes (1-6 Credits)
The following type of educational enterprise may be scheduled under this course heading: Workshops conducted by the College of Education (or developed cooperatively with other colleges and universities) and not otherwise covered in the present course listing; clinical experiences in pupil-testing centers, reading clinics, speech therapy laboratories, and special education centers; institutes developed around specific topics or problems and intended for designated groups such as school superintendents, principals, and supervisors.
Repeatable to: 6 credits.
Formerly: EDPA499.

EDMS - Measurement, Statistics, and Evaluation

EDMS410 Classroom Assessment (3 Credits)
Developing and using classroom assessments, including tests, performance assessments, rating scales, portfolios, observations and oral interactions; basic psychometric statistics; standard setting; grading; communicating assessment information; testing ethics; locating and evaluating measures; program evaluation and classroom research; assessments used for educational policy decisions.
Restriction: Junior standing or higher.

EDMS451 Introduction to Educational Statistics (3 Credits)
Introduction to statistical reasoning; location and dispersion measures; computer applications; regression and correlation; formation of hypotheses tests; t-test; one-way analysis of variance; analysis of contingency tables.
Restriction: Sophomore standing or higher.

EDMS489 Field Experiences in Measurement and Statistics (1-4 Credits)
Planned field experience in education-related activities. Credit not to be granted for experiences accrued prior to registration.
Restriction: Permission of EDUC-Human Development and Quantitative Methodology department.
Repeatable to: 4 credits.

EDMS498 Special Problems in Measurement and Statistics (1-3 Credits)
Available only to education majors who have formal plans for individual study of approved problems.
Prerequisite: Available only to education majors who have formal plans for individual study of approved problems.
Restriction: Permission of EDUC-Human Development and Quantitative Methodology department.
Repeatable to: 6 credits.

EDPS - Education Policy Studies

EDPS310 Foundations of Education (3 Credits)
Social context of education and conflicts over philosophies, values, and goals that are reflected in educational institutions in our pluralistic society. Helps teachers become reflective, critical thinkers about the social and philosophical issues they face and the choices they make.
Credit Only Granted for: EDPL301 or EDPS301.
Formerly: EDPL301.

EDPS401 Educational Policy, and Social Change (3 Credits)
An examination of education policy in relation to the social environment and change. Contemporary education and social issues are examined, including technology as a complex force which influences social change. This is a Social Foundations course.
Credit Only Granted for: EDPL401 or EDPS401.
Formerly: EDPL401.

EDSP - Education, Special

EDSP210 Foundations of Special Education: Inclusive Practices (3 Credits)
Students examine historical foundations of special education, including legislation; review components necessary for effective service delivery; and develop an understanding of the role of collaboration and consultation with parents, school personnel and other professionals.
Restriction: Sophomore standing or lower.
Credit Only Granted for: EDSP210, EDSP211 or EDSP470.

EDSP211 Foundations of Special Education: Inclusive Practices (3 Credits)
Students examine historical foundations of special education, including legislation; review components necessary for effective service delivery; and develop an understanding of the role of collaboration and consultation with parents, school personnel and other professionals.
Restriction: Sophomore standing or lower; and permission of EDUC-Counseling, Higher Education and Special Education department.
Credit Only Granted for: EDSP210, EDSP211 or EDSP470.

EDSP220 Disability in Community: Access, Accommodation, and Adaptation (3 Credits)
Examines the concept of disability in a variety of community settings. Drawing on classic and contemporary readings in psychology, sociology and special education, the course will couple conceptual and historical understanding of disability with first-hand service-learning experiences in the community. Students will develop a plan in several phases that encompasses principles of Universal Design for Living/Learning (UDL) to study and participate in community-based activities.

EDSP288 Special Topics in Teacher Education (1-3 Credits)
Restriction: Must be in a major in EDUC-College of Education; or permission of EDUC-Counseling, Higher Education and Special Education department.
Repeatable to: 6 credits if content differs.

EDSP298 Special Problems in Teacher Education (1-6 Credits)
Available only to freshmen and sophomore education majors who have definite plans for individual study of approved problems relative to their preparation for teaching. Credit according to extent of work.
Restriction: Permission of EDUC-Counseling, Higher Education and Special Education department; and available only to freshmen and sophomore education majors who have definite plans for individual study of approved problems relative to their preparation for teaching.

EDSP310 International Perspective on Educational Access for People with Disabilities (3 Credits)
A deep dive into the intersectionality of disability, culture, social norms, policy and more that impacts educational access for people with disabilities in a global context.

EDSP311 Peer Mentor Training and Certification (3 Credits)
Opportunity for peer mentor training and field experience for national CRLA certification (crla.net) to become a certified peer mentor by learning about and providing inclusive support for students with intellectual disabilities (ID) in the inclusive post-secondary TerpsEXCEED program at UMD. Students will develop an understanding of disability inclusion and ways to support students and build friendships through a mentoring relationship. Direct application of content instruction with weekly field experience allows students to maximize peer mentoring scholarship-to-practice understanding and application. The course trains peer mentors who provide same-age academic, social, and career mentoring supports for TerpsEXCEED students with intellectual disabilities on campus.

EDSP315 Inclusive Instruction: Reading Methods II (3 Credits)
Focus on current research and methods of teaching reading in the primary grades. Examination of development of a balanced literacy program of children of all reading levels in inclusive early childhood classrooms. Students will learn to select and use a variety of evidence-based reading strategies and assessment tools for reading and writing instruction. Includes field experiences.
Prerequisite: EDHD314 and EDHD425; and (EDHD419 or EDSP420).
Corequisite: EDSP423 and EDHD431; and track 1: Must be concurrently enrolled in EDSP430 and EDSP433; OR Track 2: Must be concurrently enrolled in EDHD415 and EDHD424.

EDSP321 The Young Child As Scientist (3 Credits)
A theoretical and pedagogical framework for evidence-based inclusive science instruction in inclusive early childhood classrooms. Examination of principles of inquiry-based science learning and develop strategies for helping children acquire fundamental problem-solving skills that may be applied to understanding a wide array of science content. Assessment strategies for evaluating the achievement of science objectives, and the achievement for all children will be addressed. Includes field experience.
Prerequisite: EDSP423, EDHD431, and EDSP315; and track 1: Must have completed EDSP430 and EDSP433; OR Track 2: Must have completed EDHD415 and EDHD424.
Corequisite: EDHD322, EDHD323, EDSP417, EDHD441, EDHD442, EDHD443, and EDHD444.

EDSP376 Fundamentals of Sign Language (3 Credits)
Receptive and expressive skills in American Sign Language. Examination of the causes of deafness, characteristics of deaf education, and aspects of the culture of the deaf community.
Credit Only Granted for: EDSP376 or CHSE376.
Formerly: EDSP376.

EDSP386 Experiential Learning (3-6 Credits)
Prerequisite: Learning proposal approved by the Office of Experiential Learning Programs, faculty sponsor, and student's internship sponsor.
Restriction: Junior standing or higher.

EDSP400 Instruction of Students with Severe Disabilities I (3 Credits)
Functional assessment procedures and instructional methods for students with severe disabilities.
Restriction: Must be in Special Education program. Jointly offered with EDSP602.
Credit Only Granted for: EDSP400 or EDSP602.

EDSP401 Teaching Students with Disabilities in Elementary Classrooms (3 Credits)
This course is designed for elementary education majors to prepare for teaching students with disabilities in elementary classrooms. The course examines the legal requirements for general education teachers in the public schools including best practices for participating in the Individual Education Program (IEP) team process, and understanding Response to Intervention (RTI) as a approach to the early identification and support of students with learning and behavior needs. Information is provided on the characteristics of students who have been identified as having high incidence disabilities (e.g., learning disabilities, attention deficit hyperactivity disorder, speech and language delays, emotional or behavioral disorders, and other health impairments). The course then provides information on universal design (UDL) principles for learning, instructional suggestions to include students with disabilities in the general classroom, co-teaching and methods for integrating technology and assistive technology to benefit all students.
Restriction: Permission of EDUC-Special Education department.
Credit Only Granted for: EDSP401 or EDSP499F.
Formerly: EDSP499F.

EDSP402 Field Placement: Severe Disabilities I (1 Credit)
Practicum experience in settings serving students with severe disabilities.
Restriction: Permission of EDUC-Counseling, Higher Education and Special Education department.

EDSP403 Supporting Access for Students with Multiple Disabilities Across Settings (3 Credits)
Knowledge and practices in characteristics of multiple disabilities, assessment, individualized educational programming, universal design processes for instruction, assistive technology, environmental accessibility, and collaboration.
Prerequisite: EDSP400 or EDSP602.
Jointly offered with: EDSP603.
Credit Only Granted for: EDSP403 or EDSP603.

EDSP404 Methods of Teaching Autistic Students (3 Credits)
Characteristics of children and youth diagnosed with an autism spectrum disorder (ASD), assessment, and evidence-based instructional methods in teaching autistic students who come from diverse ethnic, cultural, and socio-economic backgrounds.
Jointly offered with: EDSP604.
Restriction: Permission of EDUC-Counseling, Higher Education and Special Education department.
Credit Only Granted for: EDSP404 or EDSP604.

EDSP410 Instruction of Students with Severe Disabilities II (3 Credits)
Functional assessment, curriculum, and instruction related to academic and community functioning skills for students with severe disabilities.
Restriction: Must be in Special Education program. Jointly offered with EDSP614.
Credit Only Granted for: EDSP410 or EDSP614.

EDSP411 Foundations of Technology Integration for Curriculum Access (3 Credits)
Addresses ways to integrate technology and Assistive Technology (AT) into content area instruction, use Accessible Educational Materials (AEM), and the Universal Design for Learning (UDL) framework to evaluate, analyze, and develop responsive instruction.
Prerequisite: EDSP210 or EDSP470.
Restriction: Must be in Special Education program.

EDSP413 Principles and Practices in Positive Behavior Interventions and Classroom Supports (3 Credits)
Use of positive behavior supports to promote both classwide and individual student behavior skills through function-based behavior assessment, establishing classroom expectations, and examining common misbehaviors that often result in learning loss.
Jointly offered with: EDSP613.
Restriction: Must be in Special Education program.
Credit Only Granted for: EDSP413 or EDSP613.

EDSP415 Assessment Techniques and Practices in Special Education (3 Credits)
Knowledge and skills for understanding assessment process and interpretation of assessment data. Emphasis on psychometric aspects of assessment related to screening, eligibility, and intervention planning within a Multi-Tiered System of Supports (MTSS).
Recommended: STAT100; or SOCY201.
Jointly offered with: EDSP615.
Restriction: Must be in Special Education program.
Credit Only Granted for: EDSP415 or EDSP615.

EDSP416 Reading and Writing Instruction in Special Education I (3 Credits)
Assessment and instruction of reading and writing skills for students in special education.
Restriction: Must be in Special Education program. Jointly offered with EDSP616.
Credit Only Granted for: EDSP416 or EDSP616.

EDSP417 Reading Diagnosis and Assessment (3 Credits)
Reading Diagnosis and Assessment prepares teacher candidates to assess children in general and special early childhood educations settings in the areas of reading and writing in order to plan for instruction. The course will focus on diagnostic, screening, progress monitoring, and outcome assessments in early and beginning literacy. The course is designed to provide participants with the knowledge and skills necessary to collect and use a wide range of assessment data in general education and special education settings. Includes field experience.
Prerequisite: EDSP423, EDHD431, and EDSP315; and track 1: Must have completed EDSP430 and EDSP433; OR Track 2: Must have completed EDHD415 and EDHD424.
Corequisite: EDHD322, EDHD323, EDSP321, EDHD441, EDHD442, EDHD443, and EDHD444.

EDSP420 Child Development, Birth to Three Years (3 Credits)
Designed to provide students with an understanding of child development theory and research, as well as knowledge about typical and atypical development of children from birth to three years of age. The course emphasizes learning for children with and without disabilities, and for children who are at risk due to poverty and other environmental factors. The course will introduce how children develop and the challenges they face within the domains of physical, cognitive, language, social, and emotional development, with particular attention paid to the impact of risk factors on development. Students will become familiar with delays and differences in development that may occur as the result of disability. Finally, students will learn the effects of cultural and linguistic differences on growth and development. Information about theory and research in child development for children with and without disabilities will be enhanced through a series of observational experiences, which will build upon concepts addressed during class. Includes field experiences.
Prerequisite: EDHD210, EDHD220, and EDSP211.
Corequisite: EDHD314 and EDHD425.
Cross-listed with: EDHD434.
Credit Only Granted for: EDHD419A, EDSP420 or EDHD434.
Formerly: EDHD419A.

EDSP422 Curriculum and Instruction: Early Childhood Special Education (3 Credits)
Curriculum and instruction for young children with mild and moderate disabilities, preschool through primary grades.
Restriction: Must be in Special Education program. Jointly offered with EDSP627.
Credit Only Granted for: EDSP422 or EDSP627.

EDSP423 Assessment in Early Childhood Special Education (3 Credits)
Assessment procedures for infants and young children with disabilities, birth through grade 3.
Restriction: Must be in Special Education program.
Credit Only Granted for: EDSP423 or EDSP624.

EDSP425 Pre-Internship I (1 Credit)
This required EDSP field placement is a 3-hour per week seminar and field placement that meets across 15 weeks. Opportunities are provided to observe and participate in instructional experiences under the guidance of an assigned Host Teacher (HT) in a four-week experience in a high incidence placement AND a four-week experience in a low incidence (LI) placement. The purpose is to provide each special education teacher candidate (TC) with practical experience to complete field-based requirements and begin to meet the CEC Initial Preparation Standards (2012). Furthermore, since EDSP 425 is the first internship experience in the Special Education Program in the College of Education at University of Maryland, teacher candidates will become familiar with the Special Education Program, College of Education, Maryland State Department of Education (MSDE), Counsel for Accreditation of Educator Preparation (CAEP), and Council for Exceptional Children (CEC) expectations and requirements for graduation and teacher licensure.
Corequisite: EDSP451 and EDSP400.
Restriction: Must be in the Special Education major.

EDSP426 Pre-Internship II (1 Credit)
A 3-hour per week seminar and field placement that meets across 15 weeks. Teacher candidates will assess and provide instruction for first grade students at a local public elementary school. The field experience is also supported through content delivered in EDSP 415/615 (Assessment in Special Education) and EDSP 416/616 (Reading and Writing Instruction in Special Education). The tutoring program is meant to provide an opportunity for teacher candidates to practice the assessment and instructional skills they are learning, while also providing a needed service to the community. Teacher candidates will work one-on-one with select first graders whose teachers have determined to be in need of extra support in reading and writing.
Corequisite: EDSP415 and EDSP416.
Restriction: Must be in the Special Education major.

EDSP430 Early Intervention: Early Childhood Special Education (3 Credits)
Intervention with infants and young children with disabilities. Focus on moderate and severe disabilities.
Restriction: Must be in Special Education program.
Credit Only Granted for: EDSP430 or EDSP631.

EDSP433 Families and Culture in Early Intervention (Birth-5) (3 Credits)
Provides students with the skills and information they need to work effectively with families of young children (birth to age 5) who have or are at risk for disabilities in early childhood or early intervention programs. Students will review current local, state and federal policies establishing the rights of families of infants and young children with disabilities to participate in decision making for their child. We will discuss relevant theoretical and research literature as well as the cultural and contextual issues involved in working with families of very young children. Includes field experiences.
Prerequisite: EDHD314 and EDHD425; and (EDHD419 or EDSP420).
Corequisite: EDSP430, EDSP315, and EDHD431.

EDSP443 Language and Literacy Acquisition in Children with Disabilities (3 Credits)
Language and literacy acquisition and characteristics of typical and atypical language development in supporting students with reading and writing disabilities.
Restriction: Must be in Special Education program.
Additional Information: This course is the first of four reading courses required by the Maryland State Department of Education for teacher certification in Special Education.

EDSP451 Curriculum and Instruction: Elementary/Middle Special Education (3 Credits)
Methods for instruction of students with disabilities in the general education curriculum. Collaboration with other professionals is included.
Restriction: Must be in Special Education program. Jointly offered with EDSP652.
Credit Only Granted for: EDSP451 or EDSP652.

EDSP452 Internship I: Elementary/Middle Special Education (2-4 Credits)
Field experience in elementary/middle school special education.
Restriction: Must be in Special Education program. Jointly offered with EDSP692.
Credit Only Granted for: EDSP452 or EDSP692.

EDSP470 Introduction to Special Education (3 Credits)
Designed to give an understanding of the needs of all types of exceptional children.
Restriction: Must not have completed EDSP210.
Credit Only Granted for: EDSP210, EDSP211 or EDSP470.

EDSP484 Reading and Writing Instruction in Special Education II (3 Credits)
Focus on the development of reading and writing programs for students in special education. Builds on foundations established in EDSP416.
Prerequisite: EDSP416.
Restriction: Must be in Special Education program. Jointly offered with EDSP684.
Credit Only Granted for: EDSP484 or EDSP684.

EDSP485 Assessment and Instruction in Mathematics in Special Education (3 Credits)
Instructional methods and assessment in mathematics in special education.
Restriction: Must be in Special Education program; or must be in one of the following programs (Special Education (Doctoral); Special Education (Master's)). Jointly offered with EDSP683.
Credit Only Granted for: EDSP485 or EDSP683.

EDSP486 Promoting Prosocial Behavior in Special Education (3 Credits)
Focus on social development among students with and without disabilities, the relationship between pedagogy and student behavior, and classroom, school, and community approaches for developing prosocial behavior.
Jointly offered with: EDSP686.
Credit Only Granted for: EDSP486 or EDSP686.

EDSP487 Collaborative Partnerships in Special Education (3 Credits)
Strategies for positively collaborating with families, practitioners, and community stakeholders to implement Specially Designed Instruction (SDI) for students with disabilities.
Jointly offered with: EDSP687.
Restriction: Must be in Special Education program.
Credit Only Granted for: EDSP487 or EDSP687.

EDSP488 Selected Topics in Teacher Education (1-3 Credits)
Restriction: Permission of EDUC-Counseling, Higher Education and Special Education department; or must be in a major in EDUC-College of Education.
Repeatable to: 6 credits if content differs.

EDSP489 Field Experiences in Special Education (1-4 Credits)
Planned field experience in education-related activities. Credit not to be granted for experiences accrued prior to registration.
Restriction: Permission of EDUC-Counseling, Higher Education and Special Education department.

EDSP490 Teacher Candidate Research Seminar in Special Education (3 Credits)
Study of current issues and research concerning the education of students in special education.
Restriction: Must be in Special Education program.

EDSP495 Internship II: Elementary/Middle Special Education (6-12 Credits)
Internship II is a full-time 15 week field-placement experience in a local school system working with students with disabilities in an elementary or middle school environment. Internship II allows the intern to apply and integrate teaching competencies and responsibilities by systematically increasing independence in conducting all aspects of the special education mentor teacher's role. The intern will incrementally assume responsibility for planning, instruction, management, collaboration, and other essential tasks assigned in their internship placement. The intern will be responsible for the successful completion of edTPA, seminar assignments, and self-evaluation using Live Text for Foundational Competencies (FCs) and the Performance Based Assessment (PBA). Interns will be asked to recall and integrate course content from their prerequisite coursework during seminar and their field placement experience.
Corequisite: EDSP490.
Jointly offered with: EDSP695.
Restriction: Must be in Special Education program; or must be in one of the following programs (Special Education (Doctoral); Special Education (Master's)).
Credit Only Granted for: EDSP495 or EDSP695.

EDSP498 Special Problems in Special Education (1-6 Credits)
Available only to education majors who have definite plans for individual study of approved problems. Credit according to extent of work.
Prerequisite: Available only to education majors who have definite plans for individual study of approved problems.
Restriction: Permission of EDUC-Counseling, Higher Education and Special Education department.

EDSP499 Workshops, Clinics, and Institutes in Special Education (1-6 Credits)
The following type of educational enterprise may be scheduled under this course heading: workshops conducted by the special education department (or developed cooperatively with other departments, colleges and universities) and not otherwise covered in the present course listing. Laboratories, and special education centers; institutes developed around specific topics or problems and intended for designated groups such as school superintendents, principals and supervisors.
Repeatable to: 6 credits if content differs.

EDUC - Education

EDUC386 Experiential Learning (3-6 Credits)
Restriction: Permission of EDUC-College of Education; and junior standing or higher.

EDUC388 Special Topics in Education (3 Credits)
Restriction: Permission of EDUC-College of Education.
Repeatable to: 6 credits if content differs.

EDUC401 International and Multicultural Perspectives in Education (3 Credits)
Comparison of historical changes and current challenges, and how culture, diversity and tolerance in the US and Netherlands impacts education systems. Experiential visits to historical sites, educational institutions and notable landmarks, with a critical reflection on similarities, differences and intersections of culture, diversity, tolerance and change.
Restriction: By permission of the College of Education and the Education Abroad Office .
Credit Only Granted for: EDUC498I or EDUC401.
Formerly: EDUC498I.
Additional Information: This is a 3-week living-learning study abroad experience in the Netherlands, Germany and Belgium. The course is offered through the Education Abroad office. Prospective students must complete the MYEA application. Myea.umd.edu.

EDUC478 Using Information Technology in Schools (1-3 Credits)
Strategies, resources, tools and organizational concepts for using technology to facilitate classroom learning and school administrative functions.
Restriction: Permission of EDUC-College of Education; and junior standing or higher.
Repeatable to: 6 credits if content differs.

EDUC498 Selected Topics in Education (1-3 Credits)
Current topics and issues in education.
Restriction: Permission of EDUC-College of Education.
Repeatable to: 9 credits if content differs.

EDUC499 Honors Thesis (1-6 Credits)
Individual thesis work under supervision of faculty advisors; includes periodic seminar meetings with other honors students engaged in thesis work.
Prerequisite: Admission to College Honors Program.
Restriction: Permission of EDUC-College of Education.

ENAE - Engineering, Aerospace

ENAE100 The Aerospace Engineering Profession (1 Credit)
Overview of salient aspects of professional practice of Aerospace Engineering. Introduction to the range of technical expertise needed to succeed in the profession and the objectives of the various parts of the Aerospace Engineering program at UMCP in supporting students' efforts in gaining the required knowledge and skills. Familiarization with departmental faculty and their areas of research, creation of links with other students, professional society student chapters, and available resources. Discussion of ethical issues, business requirements, and their interactions with technical developments.
Recommended: ENES100 and MATH140.

ENAE200 Aerospace Engineering Profession II (1 Credit)
Overview of the engineering profession as it pertains to the role of the engineer in society, professional practice and ethical standards, career development, opportunities and need for lifelong learning, importance of safety and standards, effective written, visual, and oral communications, and the impact of the engineering profession on global issues.
Recommended: ENAE100.
Restriction: Must be in Engineering: Aerospace program; or permission of ENGR-Aerospace Engineering department.

ENAE202 Computing Fundamentals for Engineers (3 Credits)
Introduction to computer programming for the solution of engineering problems. Python & MATLAB languages including flow control, functions, file handling, arrays, and data structures. Students will be introduced to computing fundamentals, principles of software engineering, object-oriented programming, and algorithms.
Corequisite: MATH141.
Credit Only Granted for: ENAE202 or ENME202.

ENAE203 Introduction to Computer-Aided Design (1 Credit)
Introduces students to the principles of computer-aided design (CAD), with a focus on building core skills in 2D sketching, 3D part modeling, assemblies, and technical documentation. Course covers fundamental CAD techniques, creating and modifying complex geometries, managing design intent through parametric modeling, and producing industry-standard technical drawings. Students will apply these skills to create and refine components, culminating in a fully realized aerospace CAD project by semester's end.
Recommended: ENAE100.
Restriction: Must be in Engineering: Aerospace program.
Credit Only Granted for: ENAE203 or ENME272.

ENAE222 Aerospace Mechanics (4 Credits)
Combines the fundamental concepts of Statics and Mechanics into a single course focused on aerospace applications. Concepts include: equilibrium of forces and moments on a structure, stress & strain, material properties, analysis of axial loads, torsional loads, bending and shear loads, beam deflection, buckling of columns, fatigue analysis, and statically indeterminate structures.
Prerequisite: Minimum grade of C- in MATH141 and PHYS161; and must have completed or be concurrently enrolled in MATH241.
Restriction: Must be in Engineering: Aerospace program.
Credit Only Granted for: ENAE222 or ENES220.

ENAE283 Foundations of Aerospace I (3 Credits)
Introduction to the fundamental disciplines of aerospace engineering, and the systems concepts that integrate these into conceptual designs for flight vehicles. Course covers the foundations of aerodynamics, propulsion, aerospace materials, flight mechanics, orbital mechanics, vehicle stability and control.
Prerequisite: Minimum grade of C- or better in PHYS161 and MATH141; and must have completed or be concurrently enrolled in ENAE222.
Restriction: Must be in Engineering: Aerospace program.
Credit Only Granted for: (ENAE281 and ENAE282) or ENAE283.
Formerly: ENAE281 and ENAE282.

ENAE284 Foundations of Aerospace II (3 Credits)
Continuation of ENAE283. Introduction to the fundamental disciplines of aerospace engineering, and the systems concepts that integrate these into conceptual designs for flight vehicles. Course covers the foundations of aerodynamics, propulsion, aerospace materials, flight mechanics, orbital mechanics, vehicle stability and control.
Prerequisite: Minimum grade of C- in ENAE222, ENAE283, PHYS260, and PHYS261; and must have completed or be concurrently enrolled in ENES232 and MATH243.
Restriction: Must be in Engineering: Aerospace program.

ENAE288 Topics in Aerospace Engineering (1-3 Credits)
Introductory topics in the field of aerospace engineering.
Restriction: Permission of ENGR-Aerospace Engineering Department.
Repeatable to: 6 credits if content differs.

ENAE301 Dynamics of Aerospace Systems (3 Credits)
Kinematics and dynamics of three dimensional motion of point masses and rigid bodies with introduction to more general systems. Primary emphasis on Newtonian methods. Practice in numerical solutions and computer animation of equations of motion using MATLAB.
Prerequisite: PHYS271, MATH461, PHYS270, MATH246, ENAE283, ENAE202, ENES102, and MATH241.
Restriction: Must be in Engineering: Aerospace program; or permission of ENGR-Aerospace Engineering department.

ENAE310 Incompressible Aerodynamics (3 Credits)
First course of a two-course sequence in fluid mechanics for aerospace engineers. Topics covered include basic governing equations of incompressible fluid flow, potential flow theory, analysis of elementary 2D incompressible flows using superposition of elementary flows, analysis of airfoils using conformal mapping and classical thin airfoil theory, introduction to Helmholtz vortex theorems and Biot-Savart Law, aerodynamics of finite span wings and Prandtl lifting line theory.
Prerequisite: Minimum grade of C- in PHYS270, PHYS271, MATH241, MATH243, ENES232, ENAE202, and ENAE284.
Restriction: Must be in Engineering: Aerospace program; or permission of ENGR-Aerospace Engineering department; and junior standing or higher.
Credit Only Granted for: ENAE310 or ENAE414.
Formerly: ENAE414.

ENAE311 Compressible Aerodynamics (3 Credits)
Fundamentals of aerodynamics. Elements of compressible flow. Normal and oblique shock waves. Flows through nozzles, diffusers and wind tunnels. Elements of the method of characteristics and finite difference solutions for compressible flows. Aspects of hypersonic flow.
Prerequisite: PHYS271, (MATH240 or MATH461), PHYS270, MATH246, ENAE283, ENES220, ENAE202, MATH241, and ENES232.
Restriction: Must be in Engineering: Aerospace program; or permission of ENGR-Aerospace Engineering department; and junior standing or higher.
Credit Only Granted for: ENAE410 or ENAE311.

ENAE324 Aerospace Structures (4 Credits)
Analysis of torsion, beam bending, plate bending, buckling and their application to aerospace.
Prerequisite: ENES220.
Restriction: Must be in Engineering: Aerospace program.
Credit Only Granted for: ENAE324 or ENAE325.

ENAE325 Aerospace Structures (3 Credits)
Modeling and analysis of aerospace structures. Topics include bending and torsion of plates, beams, and thin-walled structures, buckling, and damage tolerance. Introduction to finite element modeling and composite structures.
Prerequisite: ENAE222 and ENAE284.
Restriction: Must be in Engineering: Aerospace program.
Credit Only Granted for: ENAE324 or ENAE325.

ENAE362 Aerospace Instrumentation and Experimentation (3 Credits)
Basic instrumentation electronics including DC electronics, AC electronics, semiconductors, electro-optics and digital electronics. Sensing devices used to carry out experiments in Aerospace Engineering includes metrology, machine tool measurements, bridge circuits, optical devices, and introduction to computer based data acquisition. Topics chosen to support measurements in aerodynamics, flight structures and flight control.
Prerequisite: MATH246 and ENAE283.
Restriction: Must be in Engineering: Aerospace program; and junior standing or higher.

ENAE364 Aerospace Engineering Laboratory (3 Credits)
Application of fundamental experimental methods and measurement technologies for aerospace engineering. Includes experiments in compressible and incompressible aerodynamics, structures, signal processing, dynamics and control. Correlation of theory with experimental results.
Prerequisite: Minimum grade of C- or better in ENAE310 and ENAE362; and must have completed or be concurrently enrolled in ENAE325, ENAE410, and ENAE432.
Restriction: Must be in Engineering: Aerospace program; or permission of ENGR-Aerospace Engineering department.
Credit Only Granted for: ENAE364 or ENAE464.
Formerly: ENAE464.

ENAE380 Flight Software Systems (3 Credits)
Avionics using advanced sensor and computing technologies are at the heart of every modern Aerospace vehicle. Advanced software systems to improve cockpit safety and enable unmanned and deep-space missions. Object-oriented programming and software engineering concepts required to design and build complex flight software systems. Software validation, verification and real-time performance analysis to assess flight software system reliability and robustness. Human-machine interface design for piloted systems. Automatic onboard data acquisition and decision-making for unmanned air and space vehicles.
Prerequisite: ENAE283 and ENAE202.
Restriction: Must be in Engineering: Aerospace program; and junior standing or higher.

ENAE398 Honors Research Project (1-3 Credits)
Planned sequence of steps in aerospace honors research in which students take three (3) consecutive semesters of this course in partial fulfillment of aerospace engineering honors program requirements. The first semester consists of a series of seminars and meetings with faculty mentors on honors research; two semesters consist of undergraduate honors research project and paper conducted under the direction of an aerospace engineering faculty member to be presented at a conference.
Prerequisite: Must be accepted into Aerospace Honors Program.
Restriction: Must be in Engineering: Aerospace program.
Repeatable to: 3 credits if content differs.

ENAE403 Aircraft Flight Dynamics (3 Credits)
Study of motion of aircraft, equations of motion, aerodynamic force representation, longitudinal and lateral motions, response to controls and to atmospheric disturbances, handling qualities criteria and other figures of merit.
Prerequisite: ENAE414 and ENAE432.
Restriction: Must be in Engineering: Aerospace program; or permission of ENGR-Aerospace Engineering department.

ENAE404 Space Flight Dynamics (3 Credits)
Three-dimensional motion under central fields. Solutions to orbital motion, orbital elements, time elements. Kepler's laws. Orbital maneuvering, rendezvous and station-keeping. Rigid-body attitude dynamics, spacecraft attitude dynamics.
Prerequisite: ENAE301.
Restriction: Must be in Engineering: Aerospace program; or permission of ENGR-Aerospace Engineering department.

ENAE410 Compressible Aerodynamics (3 Credits)
Second course of a two-course sequence in fluid mechanics for aerospace engineers. Topics covered include basic equations of compressible flow, definitions of compressibility, shock waves, expansion waves, flows through nozzles and diffusers, subsonic flow over airfoils, linearized supersonic flow over airfoils, basic equations of viscous flow, internal flow, boundary layers, introduction to turbulence.
Prerequisite: Minimum grade of C- in ENES232, MATH241, and ENAE310.
Restriction: Must be in Engineering: Aerospace program; or permission of ENGR-Aerospace Engineering department; and junior standing or higher.
Credit Only Granted for: ENAE410 or ENAE311.
Formerly: ENAE311.

ENAE414 Incompressible Aerodynamics (3 Credits)
Aerodynamics of inviscid incompressible flows. Aerodynamic forces and moments. Fluid statics/buoyancy force. Vorticity, circulation, the stream function and the velocity potential. Bernoulli's and Laplace's equations. Flows in low speed wind tunnels and airspeed measurement. Potential flows involving sources and sinks, doublets, and vortices. Development of the theory of airfoils and wings.
Prerequisite: PHYS271, (MATH240 or MATH461), PHYS270, MATH246, ENAE283, ENES220, ENAE202, MATH241, and ENES232.
Restriction: Must be in Engineering: Aerospace program; or permission of ENGR-Aerospace Engineering department; and junior standing or higher.
Credit Only Granted for: ENAE310 or ENAE414.

ENAE420 Computational Structural Mechanics (3 Credits)
Introductory of finite element methods for aerospace engineering modeling and analysis; equips students with ability to understand manuals of commercial finite element analysis software.
Prerequisite: ENES220 and MATH241; and must have completed a course in linear algebra.
Restriction: Must be in Engineering: Aerospace program; or permission of ENGR-Aerospace Engineering department.

ENAE423 Vibration and Aeroelasticity (3 Credits)
Dynamic response of single and multiple degrees of freedom systems, finite element modeling, wing divergence, aileron reversal, wing and panel flutter.
Prerequisite: ENAE324.
Restriction: Must be in Engineering: Aerospace program; or permission of ENGR-Aerospace Engineering department.

ENAE425 Mechanics of Composite Structures (3 Credits)
Introduction to structures composed of composite materials and their applications in aerospace. In particular, filamentary composite materials are studied. Material types and fabrication techniques, material properties, micromechanics, anisotropic elasticity, introduction to failure concepts.
Prerequisite: MATH246, ENAE324, ENES220, and MATH241.

ENAE432 Control of Aerospace Systems (3 Credits)
An introduction to the feedback control of dynamic systems. Laplace transforms and transfer function techniques; frequency response and Bode diagrams. Stability analysis via root locus and Nyquist techniques. Performance specifications in time and frequency domains, and design of compensation strategies to meet performance goals.
Prerequisite: Minimum grade of C- in ENAE301 and ENAE283.
Restriction: Junior standing or higher; and must be in Engineering: Aerospace program.

ENAE441 Space Navigation and Guidance (3 Credits)
Principles of navigation. Celestial, radio, and inertial navigation schemes. Navigational and guidance requirements for orbital, planetary, and atmospheric entry missions. Fundamentals of estimation theory, linear and nonlinear filtering techniques.
Prerequisite: Minimum grade of C- or better in ENAE432; and must have completed or be concurrently enrolled in ENAE404.
Restriction: Must be in Engineering: Aerospace program; or permission of ENGR-Aerospace Engineering department.

ENAE450 Robotics Programming (3 Credits)
Introduces students to the Robot Operating System (ROS) as well as to many of the available tools commonly used in robotics. Lectures focus on theory and structure, whereas laboratory sections will focus on applications and implementations. Students learn how to create software and simulations, interface to sensors and actuators, and integrate control algorithms. The course works through exercises involving a number of autonomous robots (i.e., ground and air vehicles) that students will eventually use in their subsequent RAS minor courses. Topics include: ROS architecture, console commands, ROS packages, simulation environments, visualizations, autonomous navigation, manipulation, and robot vision.
Prerequisite: ENME480 or ENAE380.
Restriction: Must be in the Robotics and Autonomous Systems (RAS) minor; or permission of department.
Additional Information: Students in the Robotics and Autonomous Systems minor should take ENME480 as a prerequisite; Aerospace Engineering students not in the minor should take ENAE380.

ENAE455 Aircraft Propulsion and Power (3 Credits)
Thermodynamic cycle analysis, aerothermochemistry of fuels and propellants, operating principles of piston, turbojet, fanjet, and other variations of airbreathing aircraft power units.
Prerequisite: ENES232, ENAE414, and ENAE311.
Restriction: Must be in Engineering: Aerospace program; or permission of ENGR-Aerospace Engineering department.

ENAE457 Space Propulsion and Power (3 Credits)
Thermodynamic cycle analysis, aerothermochemistry of fuels and propellants, operating principles of rocket, ion, and other exoatmospheric power units.
Prerequisite: PHYS271, ENES232, PHYS270, and ENAE311.
Restriction: Must be in Engineering: Aerospace program; or permission of ENGR-Aerospace Engineering department. And senior standing.

ENAE464 Aerospace Engineering Laboratory (3 Credits)
Application of fundamental measuring techniques to measurements in aerospace engineering. Includes experiments in aerodynamics, structures, propulsion, flight dynamics and astrodynamics. Correlation of theory with experimental results.
Prerequisite: ENAE324, ENAE362, ENAE311, and ENAE432.
Restriction: Must be in Engineering: Aerospace program; or permission of ENGR-Aerospace Engineering department.
Credit Only Granted for: ENAE464 or ENAE364.

ENAE467 Advanced Space Propulsion and Power (3 Credits)
Charged particle motion, drift mechanisms, plasma sheaths, creation of plasmas. Representative electrothermal, electrostatic, and electromagnetic propulsion technologies. Power production and direct-drive thrust generation using fusion as time permits.
Prerequisite: ENAE457.
Jointly offered with: ENAE667.
Restriction: Permission of Instructor.
Credit Only Granted for: ENAE488I, ENAE467, or ENAE667.
Formerly: ENAE488I.

ENAE471 Aircraft Flight Testing (3 Credits)
Provides basic instruction to aircraft flight testing and demonstrates need for systematic, well-proven technique to allow for accurate airplane performance. Concepts of aerodynamics, airplane performance, and stability and control. Emphasis on single-engine general aviation type aircraft.
Prerequisite: ENAE414.
Corequisite: ENAE403.
Restriction: Must be in Engineering: Aerospace program.

ENAE472 Introduction to Hypersonics (3 Credits)
Introduces students to the various key aspects of flight at hypersonic speeds. Critical aerodynamic phenomena to be covered includes the qualitative behavior of flow fields in the high-Mach-numberlimit, approximate methods for quantifying surface pressure, and estimates of viscous drag and heating. High-speed air-breathing propulsion systems will be discussed, including cycle analysis and performance metrics for propulsion, with a main emphasis onthe fundamentals of ramjet and scramjet engines. Key Guidance, Navigation and Control (GNC) concepts for various hypersonic vehicle types will also be introduced, including the design of appropriate flight trajectories and control algorithms to achieve mission goals. Finally, students will be provided with an overview of high-temperature materials, structures, and thermal protection systems.
Prerequisite: ENAE311 or enrolled in hypersonics graduate certificate program.
Corequisite: ENAE481 or ENAE483 (if not enrolled in hypersonics graduate certificate program).
Restriction: Students must be in the Hypersonic Graduate Certificate Program (code: Z165) or receive permission from the department.
Credit Only Granted for: ENAE488N or ENAE472.
Formerly: ENAE488N.

ENAE480 Fundamentals of Aerospace Design (2 Credits)
Principles of aerospace systems analysis and design. Vehicle performance analysis and optimization. Introduction to systems analysis and design, including design optimization and trade studies, sensitivity analysis, mass and cost estimation, multivariate design optimization, and risk analysis. Aerospace human physiology and impact on the design process. Design of vehicle systems including avionics, power, propulsion, life support, human factors, structures, actuator and mechanisms, and thermal control.
Prerequisite: Minimum grade of C- in ENAE301, ENAE310, ENAE325, and ENAE362; and must have completed or be concurrently enrolled in ENAE491 or ENAE493.
Restriction: Must be in Engineering: Aerospace program; or permission of ENGR-Aerospace Engineering department.

ENAE481 Principles of Aircraft Design (3 Credits)
Aircraft design principles blending both synthesis and analysis. The iterative nature of the design process. Applied aerodynamics. Elements of aircraft performance calculation and optimization. Design of aircraft including payload, crew and avionics provisions, propulsion selection and sizing, aerodynamic configuration optimization, mass properties, stability and control characteristics, and vehicle subsystems. Individual student projects in aircraft design.
Prerequisite: ENAE324, ENAE362, and ENAE432.
Corequisite: ENAE414.
Restriction: Must be in Engineering: Aerospace program; or permission of ENGR-Aerospace Engineering department.
Credit Only Granted for: ENAE481 or ENAE491.

ENAE482 Aeronautical Systems Design (3 Credits)
Senior capstone design course in the aeronautics track. Introduction of computerized methods for sizing and performance analysis. More comprehensive methods to predict weight, aerodynamics and propulsion system characteristics. Consideration in design disciplines such as vulnerability, maintainability, produceability, etc. Groups of students will complete, brief and report on a major design study to specific requirements.
Prerequisite: ENAE455, ENAE423, ENAE403, and ENAE481.
Restriction: Must be in Engineering: Aerospace program; and senior standing or higher.

ENAE483 Principles of Space Systems Design (3 Credits)
Principles of space systems analysis and vehicle design. Launch vehicle performance analysis and optimization. Design of vehicle systems including avionics, power, propulsion, life support, human factors, structures, actuator and mechanisms, and thermal control. Design processes and design synthesis. Individual student projects in vehicle design.
Prerequisite: ENAE404, ENAE324, ENAE362, and ENAE432.
Restriction: Must be in Engineering: Aerospace program; or permission of ENGR-Aerospace Engineering department.
Credit Only Granted for: ENAE483 or ENAE493.

ENAE484 Space Systems Design (3 Credits)
Senior capstone design course in the space track. Group preliminary design of a space system, including system and subsystem design, configuration control, costing, risk analysis, and programmatic development. Course also emphasizes written and oral engineering communications.
Prerequisite: ENAE423, ENAE483, ENAE441, and ENAE457.
Restriction: Must be in Engineering: Aerospace program.

ENAE488 Topics in Aerospace Engineering (1-4 Credits)
Technical elective taken with the permission of the student's advisor and instructor. Lecture and conference courses designed to extend the student's understanding of aerospace engineering. Current topics are emphasized.
Prerequisite: Permission of student's advisor required.
Restriction: Permission of instructor.

ENAE491 Principles of Aircraft Design (2 Credits)
Companion course to ENAE480, focusing on topics specific to aeronautical systems, and starting the team design exercise to be continued in ENAE492 in the Spring. Aircraft design principles blending both synthesis and analysis. Applied aerodynamics, elements of aircraft performance calculation and optimization. Design of aircraft including payload, crew and avionics provisions, propulsion selection and sizing, aerodynamic configuration optimization, mass properties, stability and control characteristics, and vehicle subsystems.
Prerequisite: Minimum grade of C- in ENAE325; and must have completed or be concurrently enrolled in ENAE403, ENAE455, and ENAE480.
Restriction: Must be in Engineering: Aerospace program; or permission of ENGR-Aerospace Engineering department.
Credit Only Granted for: ENAE481 or ENAE491.

ENAE492 Aeronautical Systems Design (3 Credits)
Senior capstone design course in the aeronautics track. Introduction of computerized methods for sizing and performance analysis. More comprehensive methods to predict weight, aerodynamics and propulsion system characteristics. Consideration in design disciplines such as vulnerability, maintainability, produceability, etc. Groups of students will complete, brief and report on a major design study to specific requirements.
Prerequisite: ENAE403, ENAE423, ENAE455, and ENAE491.
Restriction: Must be in Engineering: Aerospace program; and senior standing or higher.
Credit Only Granted for: ENAE482 or ENAE492.
Formerly: ENAE482.

ENAE493 Principles of Space Systems Design (2 Credits)
Companion course to ENAE480, focusing on topics specific to space systems, and starting the team design exercise to be continued in ENAE494. Space systems design principles, including design of life support systems, spacecraft internal layout for habitability and functionality, airlock design and extravehicular activity, interplanetary and planetary surface navigation, communications link budgets, structural margins of safety calculations, design of spacecraft power generation and energy storage, propulsion system design including reaction control systems, and spacecraft thermal control system design and analysis.
Prerequisite: Minimum grade of C- in ENAE325; and must have completed or be concurrently enrolled in ENAE404, ENAE457, and ENAE480.
Restriction: Must be in Engineering: Aerospace program; or permission of ENGR-Aerospace Engineering department.
Credit Only Granted for: ENAE483 or ENAE493.

ENAE494 Space Systems Design (3 Credits)
Senior capstone design course in the space track. Group preliminary design of a space system, including system and subsystem design, configuration control, costing, risk analysis, and programmatic development. Course also emphasizes written and oral engineering communications.
Prerequisite: ENAE404, ENAE423, ENAE457, and ENAE493 .
Restriction: Must be in Engineering: Aerospace program; and senior standing or higher.
Credit Only Granted for: ENAE484 or ENAE494.
Formerly: ENAE484.

ENAE499 Elective Research (3 Credits)
Undergraduate research project and paper conducted under the direction of an aerospace engineering faculty member to be presented at a conference or competition.
Prerequisite: Permission from student's advisor required.
Restriction: Senior standing or higher; and must be in Engineering: Aerospace program; and permission of instructor; and permission of ENGR-Aerospace Engineering department.
Repeatable to: 6 credits if content differs.

ENBC - Biocomputational Engineering

ENBC301 Introduction to Biocomputational Engineering (1 Credit)
Provides practical tools to help Biocomputational Engineering majors to think critically about their goals and career paths and to utilize their major to set their career trajectory.
Restriction: Permission of ENGR-Fischell Department of Bioengineering department; and must be in Biocomputational Engineering major.

ENBC311 Python for Data Analysis (3 Credits)
Provides an introduction to structured programming, computational methods, and data analysis techniques with the goal of building a foundation allowing students to confidently address problems in research and industry. Fundamentals of programming, algorithms, and simulation are covered from a general computer science perspective, while the applied data analysis and visualization portion makes use of the Python SciPy stack.
Prerequisite: Minimum grade of C- in MATH241; and minimum grade of C- in BIOE241 or approved prior study in Matlab.
Restriction: Permission of ENGR-Fischell Department of Bioengineering department; and must be in the Biocomputational Engineering major.
Credit Only Granted for: BIOE489A, BIOE442 or ENBC311.

ENBC312 Object Oriented Programming in C++ (3 Credits)
Provides a solid foundation for object-oriented programming using the C ++ programming language. It introduces fundamental conceptual tools and their implementation of object-oriented design and programming such as: object, type, class, implementation hiding, inheritance, parametric typing, function overloading, polymorphism, source code reusability, and object code reusability. Fundamental principles of object-oriented design and programming are stressed while covering the language details.
Restriction: Permission of ENGR-Fischell Department of Bioengineering department; and must be in the Biocomputational Engineering major.

ENBC321 Machine Learning for Data Analysis (3 Credits)
Instructs students in the fundamentals of machine learning methods through examples in the biological phenomenon and clinical data analysis. This course is designed to share knowledge of real-world data science and aid to learn complex machine learning theory, algorithms, and coding libraries in a simple way. Students will learn the machine learning theory, but they will also get hands-on practice building their models using programming tools such as Python and R.
Prerequisite: Minimum grade of C- in ENBC311 and ENBC332.
Restriction: Permission of ENGR-Fischell Department of Bioengineering department; and must be in the Biocomputational Engineering major.

ENBC322 Algorithms (3 Credits)
Presents an introduction to the techniques for designing efficient computer algorithms and analyzing their complexity using the Python programming language. Students will gain insight into principles and data-structures useful in algorithm design. General topics include asymptotics, sorting and searching, hashing, algorithm design techniques, graph algorithms, and dynamic programming.
Corequisite: Must have completed with a minimum grade of C- or be concurrently enrolled in ENBC311.
Restriction: Permission of ENGR-Fischell Department of Bioengineering department; and must be in the Biocomputational Engineering major.
Credit Only Granted for: ENEB355 or ENBC322.

ENBC331 Applied Linear Systems and Differential Equations (3 Credits)
Applications of linear algebra and differential equations to bioengineering and biomolecular systems. Designed to instruct students to relate mathematical approaches in bioengineering to their physical systems. Examples will emphasize fluid mechanics, mass transfer, and physiological systems.
Prerequisite: Minimum grade of C- in BIOE241 or approved prior study in Matlab.
Restriction: Permission of ENGR-Fischell Department of Bioengineering department; and must be in the Biocomputational Engineering major.
Credit Only Granted for: BIOE371 or ENBC331.

ENBC332 Statistics, Data Analysis, and Data Visualization (3 Credits)
Instructs students in the fundamentals of probability and statistics through examples in biological phenomenon and clinical data analysis. Data visualization strategies will also be covered.
Prerequisite: Minimum grade of C- in BIOE241 or approved prior study in Matlab.
Restriction: Permission of ENGR-Fischell Department of Bioengineering department; and must be in the Biocomputational Engineering major.
Credit Only Granted for: BIOE372, ENBC332 or STAT464.

ENBC341 Biomolecular Engineering Thermodynamics (3 Credits)
A quantitative introduction to thermodynamic analysis of biomolecular systems. The basic laws of thermodynamics will be introduced and explained through a series of examples related to biomolecular systems.
Prerequisite: Minimum grade of C- in PHYS260 and PHYS261.
Restriction: Permission of ENGR-Fischell Department of Bioengineering department; and must be in the Biocomputational Engineering major.
Credit Only Granted for: BIOE232, ENBC341 or CHBE301.

ENBC342 Computational Fluid Dynamics and Mass Transfer (3 Credits)
Principles and applications of fluid mechanics with a focus on bioengineering topics. Content includes conservation of mass, momentum, and energy, as well as the application of these fundamental relations to hydrostatics, control volume analysis, internal and external flow, and boundary layers. Applications to biological and bioengineering problems such as tissue engineering, bioprocessing, imaging, and drug delivery.
Prerequisite: Minimum grade of C- in ENBC341; and minimum grade of C- in BIOE241 or approved prior study in Matlab; and must have earned a minimum grade of C- or be concurrently enrolled in ENBC331.
Restriction: Permission of ENGR-Fischell Department of Bioengineering department; and must be in the Biocomputational Engineering major.
Credit Only Granted for: BIOE331 or ENBC342.

ENBC351 Quantitative Molecular and Cellular Biology (3 Credits)
Provides a quantitative analysis of the behavior of cellular and molecular systems. The focus will be the construction and application of mechanistic models of biomolecular interaction rate processes, which form the foundation of most biological functions. The course will also provide in-depth, practical exploration into data analysis of key bioengineering techniques.
Prerequisite: Minimum grade of C- in BSCI170 or BIOE120.
Restriction: Permission of ENGR-Fischell Department of Bioengineering department; and must be in the Biocomputational Engineering major.

ENBC352 Molecular Techniques Laboratory (2 Credits)
Provides students with the opportunity to learn how biology and engineering can synergistically contribute to our understanding of biological and biomedical problems. Students will gain hands-on experience through wet lab experiments in basic techniques relevant to bioengineering.
Prerequisite: Minimum grade of C- or concurrently enrolled in ENBC351.
Restriction: Permission of ENGR-Fischell Department of Bioengineering department; and must be in the Biocomputational Engineering major.

ENBC353 Synthetic Biology (3 Credits)
Introduces students to the scientific foundation and concepts driving the fast-paced field of synthetic biology. This course aims to apply engineering principles, measurement science, and modern molecular biology to increase understanding of complex biological systems and to develop novel applications that address global challenges in health, manufacturing, energy, agriculture, and the environment. Students will explore the principles and applications of the field via in-depth analysis. The course will also address the societal issues of synthetic biology, and briefly examine interests to regulate research in this area.
Prerequisite: Minimum grade of C- in BSCI170 or BIOE120.
Restriction: Permission of ENGR-Fischell Department of Bioengineering department; and must be in the Biocomputational Engineering major.
Credit Only Granted for: BIOE461 or ENBC353.

ENBC399 Independent Study in Biocomputational Engineering (1-3 Credits)
Independent Study
Restriction: Permission of the ENGR-Biocomputational Engineering program.
Repeatable to: 12 credits if content differs.

ENBC403 Research Methods in Biological Data Mining (3 Credits)
An introduction to the fundamentals of conducting research projects utilizing a general understanding of quantitative/qualitative research, clinical data analysis, and multiple examples of different research approaches in the biological phenomenon. The course includes an overview of design strategies to implement various data mining technologies.
Prerequisite: Minimum grade of C- or concurrently enrolled in ENBC311.
Restriction: Permission of ENGR-Fischell Department of Bioengineering department; and must be in the Biocomputational Engineering major.

ENBC423 Applied Computer Vision (3 Credits)
Introduction to the basics and modern deep learning models in the Artificial Intelligence field of computer vision. The course emphasizes applications of computer vision in medical imaging. Computer vision techniques will be demonstrated using software packages implementing bioimage informatics methods.
Prerequisite: Minimum grade of C- in ENBC311 and ENBC312.

ENBC424 AI for Biocomputational Engineering (3 Credits)
Introduces students to the basics and modern deep learning models in the Artificial Intelligence field applied to computer vision problems. The course will teach ResNet for image Classification/Regression, and U-Net for semantic segmentation. The course emphasizes applications of computer vision in medical imaging and cell biology, such as detecting brain tumor using semantic deep learning segmentation network and track dynamic measurements of live 3T3 cells through time using recurrent neural network. Computer vision techniques will be demonstrated using software packages implementing bio-image informatics methods, including ImageJ (FIJI), Python with Keras Tensorflow, Pytorch, and Matlab.
Prerequisite: Minimum grade of C- in ENBC423.
Restriction: Permission of ENGR-Fischell Department of Bioengineering department; and must be in Biocomputational Engineering major.

ENBC425 Imaging and Image Processing (3 Credits)
Instructs students in the fundamentals of biomedical imaging and image processing methods through the physical principles behind major medical imaging modalities, including X-Ray, Computed Tomography (CT), and magnetic resonance imaging (MRI). This course is designed to instruct students in mathematical tools for extracting information from images. There will be real-world assignments and images, which aid in learning complex theories, applications, and coding libraries in a simple way.
Prerequisite: Minimum grade of C- in ENBC332, ENBC311, and ENBC321.
Restriction: Permission of ENGR-Fischell Department of Bioengineering department; and must be in Biocomputational Engineering major.

ENBC431 Finite Element Analysis (3 Credits)
An introduction to the theory, programming and application of the finite element method that is used to solve problems in engineering analysis and design. Modeling, analysis, and design using the FEA software SolidWorks. The objective of the course is to teach the fundamentals of the finite element method with emphasis on the underlying theory, assumption, and modeling issues as well as providing hands-on experience using finite element software to model, analyze, and design systems.
Prerequisite: Minimum grade of C- in ENBC331.
Restriction: Permission of ENGR-Fischell Department of Bioengineering department; and must be in the Biocomputational Engineering major.

ENBC441 Computational Systems Biology (3 Credits)
Introduces quantitative principles for studying biological systems using computational modeling and simulations. Topics include continuous modeling of systems using ordinary differential equations, discrete modeling using Boolean networks and Markov chains, probabilistic modeling through Bayesian networks, stochastic modeling via Monte Carlo and Brownian and molecular dynamics, model optimization, and parameter estimation. Simulation algorithms that implement these approaches will be introduced through MATLAB programming.
Prerequisite: ENBC351.
Restriction: Permission of ENGR-Fischell Department of Bioengineering department; and must be in the Biocomputational Engineering major.

ENBC455 Bioinformatics Engineering (3 Credits)
Introduces students to the core principles of bioinformatics while encouraging students to apply their programming skills to real-world biological problems. Students will learn to utilize Python to process data sets.
Prerequisite: ENBC311.
Restriction: Permission of ENGR-Fischell Department of Bioengineering department; and must be in the Biocomputational Engineering major.

ENBC491 Senior Capstone Design in Biocomputational Engineering (3 Credits)
Senior design project in which students work collaboratively in a Capstone team on a biocomputational topic. Under the guidance of a Capstone mentor, students will set project goal(s), propose project design, identify methodology, implement solutions, evaluate project results, and iterate among these steps if needed. Students will present their completed biocomputational projects to the public in a poster session. To complement the project design and implementation, students will also learn pressing ethics and DEI concerns emerging in artificial intelligence (AI), and recognize ethical responsibilities in biocomputational tasks.
Prerequisite: Must have completed 18 credits in ENBC courses.

ENCE - Engineering, Civil

ENCE100 Introduction to Civil and Environmental Engineering (1 Credit)
An overview of the department of Civil and Environment Engineering. Students are introduced to the undergraduate curriculum and will be exposed to other undergraduate and graduate students at various points in their program. The course blends panel presentations by seniors and graduate students, faculty and practitioners with a project and book review to be performed by the students.

ENCE200 Civil Engineering Graphics for Design and Construction (3 Credits)
Introduction to the basic principles and fundamentals of civil design, plan interpretation, and plan creation. Development of the knowledge and skills to analyze existing sites, environmental features, and characteristics used to develop a site properly. Introduction of the use of Computer-Aided Drafting (CAD) software in the context of civil and environmental engineering design and applications.
Prerequisite: ENES100, MATH141, and ENES102; and permission of ENGR-Civil & Environmental Engineering department.

ENCE201 Engineering Information Processing (3 Credits)
Exploration of algorithms for solving problems in several important areas of numerical computing: roots of equations; matrix algebra and the systems of linear equations; function approximation, numerical differentiation and integration; and ordinary differential equations. Issues of solution accuracy, robustness, and efficiency are also considered. Numerical techniques are presented in the context of engineering applications, and example problems are solved using a variety of computer-based tools (primarily MATLAB).
Prerequisite: ENES220 and MATH241; and permission of ENGR-Civil & Environmental Engineering department.
Corequisite: MATH246.
Credit Only Granted for: ENCE201 or ENCE203.

ENCE202 Engineering Drawings and Design for Civil and Environmental Engineers (3 Credits)
Provides students with the knowledge and skills to read, interpret, and create civil engineering drawings using computer-aided drafting. Emphasis is placed on engineering calculations related to slopes, inverts, and contours. In addition, students will develop core skills in data visualization, basic programming logic, and professional communication. The course integrates teamwork exercises and real-world scenarios to enhance students' understanding of constructability and design communication. By the end of the course, students will create a complete engineering drawing package.
Prerequisite: Minimum grade of C- in ENES100, ENES102, and MATH141.
Restriction: Permission of the ENGR-Civil & Environmental Engineering Department.
Credit Only Granted for: ENCE202 or ENCE200.
Formerly: ENCE200.

ENCE203 Data Models and Numerical Computing for Civil Engineers (3 Credits)
Introduces students to numerical methods and scientific computing with a focus on civil engineering applications. Through hands-on programming with Python, students will learn to model and analyze civil infrastructure systems. Topics include numerical solutions to linear and nonlinear equations, matrix operations, function approximation, numerical differentiation and integration, and the solution of ordinary differential equations. The course also explores the management and processing of real-world data for modern civil systems.
Prerequisite: Minimum grade of C- or better in ENES220 and MATH241.
Restriction: Permission of the ENGR-Civil & Environmental Engineering Departmen.
Credit Only Granted for: ENCE201 or ENCE203.
Formerly: ENCE201.

ENCE205 Biology for Civil and Environmental Engineers (3 Credits)
Introduction to the functions and interactions of biological systems in civil and environmental engineering systems in the context of societal issues. The course includes an introduction to biotechnological principles from a quantitative perspective, modern experimental techniques in biotechnology and methods of data analysis. Roles for civil and environmental engineers in society seen from a biotechnological perspective, and the role of biotechnology in civil and environmental engineering will be elucidated. The role of biotechnology in other engineering disciplines will also be discussed.
Prerequisite: MATH140 or equivalent.
Restriction: Must be in the Civil Engineering program; or permission of the Civil and Environmental Engineering Department.
Credit Only Granted for: BIOE120 or ENCE205.

ENCE215 Engineering for Sustainability (3 Credits)
Engineers have a key role to play in planning, designing, building, and ensuring a sustainable future. In this class, a problem-based approach is used to examine fundamentally-based analyses and approaches for engineering as sustainable society, with a focus on sustainable use of energy and materials, sustainable infrastructure solutions, atmospheric sustainability and sustainable water supply, and human population growth and resource consumption and its implications for sustainability.
Prerequisite: CHEM135; or students who have taken courses with comparable content may contact the department; and permission of ENGR-Civil & Environmental Engineering Department.

ENCE300 Fundamentals of Engineering Materials (3 Credits)
Behavior, physical, mechanical and chemical properties, design and performance of civil engineering materials, including aggregates, cement, concrete, asphalt binders and mixtures, plastics and geosynthetics, timber, metals and alloys. Modified and advanced highway materials (polymer and rubber modified mixtures, high performance concrete, composites, smart materials). Laboratory testing with hands-on experience on aggregates, Portland cement concrete, asphalt mixtures, timber and metals as per SUPERAVE, ACI design methods, and ASTM standards and specifications.
Prerequisite: ENES220; and permission of ENGR-Civil & Environmental Engineering department.

ENCE302 Probability and Statistics for Civil and Environmental Engineers (3 Credits)
Statistics is the science of data. Civil Engineers must often make decisions based on incomplete, variable or uncertain information. In addition, modern methods of design and analysis need to account for variability in natural, engineered and human systems. After successful completion of this class, a student should have facility and familiarity with established basic techniques for managing data, modeling variability and uncertainty, communicating about data and decisions, and supporting or defending a decision or judgment based on uncertain or incomplete data.
Prerequisite: MATH246 and ENCE201; and permission of ENGR-Civil & Environmental Engineering department.

ENCE303 Probability and Statistics for Civil and Environmental Engineers (3 Credits)
This course introduces students to the principles of probability, statistics, and simulation as they relate to variability and uncertainty in engineering. Students will explore key topics such as probability distributions, parameter estimation, hypothesis testing, and Monte Carlo simulations. The course emphasizes applying these concepts to real-world engineering decisions, where students will evaluate uncertainties, simulate outcomes, and formulate informed decisions.
Prerequisite: Minimum grade of C- or better in ENCE203 and MATH243.
Restriction: Permission of the ENGR-Civil & Environmental Engineering Department.
Credit Only Granted for: ENCE303 or ENCE302.
Formerly: ENCE302.

ENCE305 Fundamentals of Engineering Fluids (3 Credits)
The theoretical bases for fluid statics and dynamics, including the conservation of mass, energy and momentum. Modeling of hydraulic systems are introduced. Emphasis on pipe flow and open-channel hydraulics, with real-world applications.
Prerequisite: ENES220, PHYS260, and PHYS261; and permission of ENGR-Civil & Environmental Engineering department.
Credit Only Granted for: BIOE331, ENCE305, ENFP300, or ENME331.

ENCE310 Introduction to Environmental Engineering (3 Credits)
Introduction to the physical, chemical and biological systems relating to the quality of water, land and air environments. Fundamental principles will be emphasized, current environmental pollution problems will be examined and methods of pollution abatement discussed.
Prerequisite: PHYS260 and ENCE215; and permission of ENGR-Civil & Environmental Engineering department.

ENCE311 Sustainable Nexus: Tackling Global Challenges through Innovation and Collaboration (3 Credits)
This interdisciplinary, project-based course explores how we can drive sustainable solutions at the intersection of food, water, and energy systems. Through hands-on learning and real-world collaboration, students will tackle critical issues like resource circularity, environmental justice, and resilience in agricultural systems. Students will apply life cycle assessment, systems thinking, and design principles to create solutions that are technically sound, socially inclusive, and economically viable. Entrepreneurial thinking is embedded throughout the course, empowering students to explore sustainable business models and pathways to scale their innovations in alignment with the United Nations Sustainable Development Goals (SDGs).
Prerequisite: MATH140 or ENSP101; or equivalent.
Restriction: Must have completed at least 60 credits.

ENCE312 Engineering Economics and Project Management (3 Credits)
Provides students with an understanding of engineering economics and project management in the context of civil engineering projects. Through project-based learning, students will explore the financial and managerial aspects of project delivery, from initial concept to project completion. Topics include cash flow analysis, time value of money, economic decision-making, project scheduling, cost estimation, and risk management. By the end of the course, students will develop the skills to analyze, plan, and manage civil engineering projects, balancing economic viability with technical performance, quality, and safety. The course emphasizes real-world application, integrating industry standards and regulatory requirements.
Prerequisite: Minimum grade of C- in ENCE202; and must have completed or be concurrently enrolled in ENCE303.
Restriction: Permission of the ENGR-Civil & Environmental Engineering Department.

ENCE320 Introduction to Project Management (3 Credits)
Principles and techniques of managing engineering projects from the initiation, through planning, execution, monitoring & control, then finally closeout.
Prerequisite: Permission of ENGR-Civil & Environmental Engineering department.
Restriction: Must be in a major in ENGR-A James Clark School of Engineering.
Credit Only Granted for: BMGT485, ENCE320, ENCE325, INST408O or INST453.

ENCE325 Introduction to Construction Project Management (3 Credits)
Learn the basic topics in sourcing, planning, financing, designing, contracting, constructing and operating buildings and other facilities in the built infrastructure. Topics include construction economics, design constructability reviews, construction process planning, contracts and procurement strategies, project scheduling and resource utilization, site layout planning, project cost and quality controls, temporary structures, environmental sustainability, project handover procedures, facility operation and management, IT-based tools for construction project and resource management.
Restriction: Must be in a major in ENGR-A. James Clark School of Engineering; or must be in a major in ARCH-School of Architecture, Planning, & Preservation; or must be in the Construction Project Management minor. And permission of ENGR-Civil & Environmental Engineering department.
Credit Only Granted for: BMGT485, ENCE320, ENCE325, INST408O or INST453.

ENCE336 Environment and Water I: Introduction to Environmental Engineering (3 Credits)
Provides an introduction to the fundamental principles of environmental engineering, focusing on the management of air, water, and land resources to protect human health and ecosystems. Students will explore key topics such as mass balances, environmental chemistry, sustainability, pollution control, and risk assessment. Through project-based learning, students will apply scientific and engineering concepts to real-world environmental challenges, developing practical solutions for water and air pollution, waste management, and sustainable design. The course prepares students for advanced study in environmental and water resources engineering.
Prerequisite: Minimum grade of C- in CHEM135 and MATH141; and must have completed or be concurrently enrolled in ENCE305.
Restriction: Permission of the ENGR-Civil & Environmental Engineering Department.

ENCE340 Fundamentals of Geotechnical Engineering (3 Credits)
Introductory study of soils in civil engineering. Soil origin, phase relationships and classification schemes. Soil hydraulics: capillary, effective stress, permeability and seepage considerations. Basic stress distribution theories and soil consolidation-settlement analysis. Integration of shear strength evaluation with slope stability analysis. If time permits, topics such as applications in geoenvironmental engineering will be covered.
Prerequisite: ENES220; and permission of ENGR-Civil & Environmental Engineering department.

ENCE342 Structural Analysis and Design I (3 Credits)
Provides an introduction to structural analysis, focusing on the behavior of statically determinate and indeterminate structures. Students will learn how to analyze structural systems under various loading conditions and explore real-world examples of structural failures. A key component of the course is the introduction of Python as a computational tool for structural analysis. The course will also cover foundational concepts in structural mechanics, such as the analysis of trusses, beams, frames, arches, and cable structures, preparing students for more advanced structural design in later courses.
Prerequisite: Minimum grade of C- in ENES220 and ENCE203.
Restriction: Permission of the ENGR-Civil & Environmental Engineering Department.

ENCE353 Introduction to Structural Analysis (3 Credits)
The basic tools of structural analysis and design. Design loads. Equilibrium of external and internal forces. Shear and moment diagrams in beams and frames. Truss analysis. Influence line diagrams. The slope-deflection method and method of consistent deformation. Matrix stiffness methods for beams, frames and trusses.
Prerequisite: Permission of ENGR-Civil & Environmental Engineering department; and (MATH246 and ENES220).

ENCE360 Analysis of Civil Engineering Systems (3 Credits)
Introduction to systems approach and systems analysis in civil and environmental engineering. Introduction to systems analysis tools that facilitate engineering management decision making including optimization and computer simulation. Introduction to linear and nonlinear mathematical optimization including linear and integer programming, elementary nonlinear programming and dynamic programming.
Prerequisite: ENCE201 and MATH140; and permission of ENGR-Civil & Environmental Engineering department.

ENCE365 Materials in Civil Infrastructure (4 Credits)
This project-based course introduces students to the behavior, design, and performance of materials used in civil infrastructure. Through experimental labs and real-world case studies, students gain hands-on experience testing the mechanical and physical properties of key civil engineering materials, such as concrete, asphalt, aggregates, and stabilized materials. Students will design experiments, collect and analyze data, and apply statistical tools (e.g., regression, ANOVA). Working in teams, students will deliver technical reports and assess sustainability considerations, contributing to solutions for infrastructure challenges in buildings, pavements, foundations, and bridges.
Prerequisite: Minimum grade of C- in ENES220; and must have completed or be concurrently enrolled in ENCE303.
Restriction: Permission of the ENGR-Civil & Environmental Engineering Department.
Credit Only Granted for: ENCE300 or ENCE365.
Formerly: ENCE300.

ENCE367 Civil Engineering Systems Optimization (4 Credits)
This project-based course introduces undergraduate civil engineering students to systems analysis, modeling, optimization, and the quantitative techniques used in problem-solving and decision-making. The following major topics are covered: deterministic modeling and optimization, linear programming, Integer programming, and network problems.
Prerequisite: Minimum grade of C- in MATH243; and must have completed or be concurrently enrolled in ENCE303.
Restriction: Permission of the ENGR-Civil & Environmental Engineering Department.
Credit Only Granted for: ENCE367 or ENCE360.
Formerly: ENCE360.

ENCE370 Introduction to Transportation Engineering and Planning (3 Credits)
Engineering problems of transportation by highways, airways, pipelines, waterways, and railways. Transportation modes and technologies, vehicle dynamics, basic facility design, traffic stream models, capacity analysis, transportation planning, evaluation and choice, and network analysis.
Prerequisite: ENCE201, PHYS260, and PHYS261; and permission of ENGR-Civil & Environmental Engineering department.

ENCE383 Transportation Systems I (3 Credits)
This course introduces students to the key principles of transportation systems, focusing on traffic operations, control, and transportation planning. Topics include vehicle motion, traffic flow theory, traffic signal design, intelligent transportation systems (ITS), and the four-step transportation planning model. Students will gain hands-on experience with state-of-the-art software for traffic analysis and simulation, enhancing their ability to analyze, design, and optimize transportation systems. The course emphasizes practical applications through group projects that involve real-world problem-solving in transportation engineering.
Prerequisite: Minimum grade of C- or better in ENCE303, PHYS260, and PHYS261.
Restriction: Permission of the ENGR-Civil & Environmental Engineering Department.

ENCE398 Honors Research Project (1-3 Credits)

ENCE401 Statistical and Machine Learning Models for Natural Hazards Prediction (3 Credits)
Infrastructure and other engineered systems are exposed to a variety of natural hazards, such as precipitation, high winds, storm surge, and earthquake-induced ground shaking. Assessment of the risks involves the development of models to predict hazard severity. While these models may involve a range of techniques, this course centers on prediction models that involve statistical and machine-learning approaches. Specifically, this course will focus on the practical application of statistical and machine learning regression models, including data processing, model specification, model development, and model assessment within the context of natural hazard predictions. Models selected for consideration in this course are informed by present-day practices for multiple types of natural hazards.
Prerequisite: ENCE203 or experience with a programming language (e.g., Python, R, MATLAB); ENCE303 or another course that provides the relevant probability/statistics required content; and permission of the ENGR-Civil and Environmental Engineering department.
Jointly offered with: ENCE601.
Credit Only Granted for: ENCE401, ENCE489X, ENCE601, or ENCE689X.
Formerly: ENCE489X.

ENCE402 Simulation and Design of Experiments for Engineers (3 Credits)
Review of statistics and hypothesis testing, sample design and design of experiments, generation of discrete and continuous distributions and their applications. Introduction of simulation languages and simulation of discrete and continuous engineering systems. Output analysis, model validation and sensitivity and reliability analysis.
Prerequisite: ENCE302; and permission of ENGR-Civil & Environmental Engineering department.

ENCE403 Sustainability and Smart Green Cities (3 Credits)
Introduces the principles and components of smart green cities. System approach to sustainability and green city development is examined. City wide action plan components are reviewed and analysed in regards to sustainability, resilience, social and economic elements. The UN Sustainability development goals are covered as pertinent to smart green cities. Green initiatives and C40 emission reduction plans and components are reviewed. The course introduces concepts and calculations of sustainable energy and electric vehicles, sustainability assessments and rating of Smart Green Cities. Case studies on such topics are reviewed and discussed.
Prerequisite: MATH140 .
Credit Only Granted for: ENCE489C or ENCE403.
Formerly: ENCE489C.

ENCE404 Sustainable Infrastructure & Condition (3 Credits)
Introduces the principles of sustainability, sustainability metrics applied to civil infrastructure. Resiliency of civil infrastructure and rating criteria are examined as well. Condition assessment of civil infrastructure and Non-Destructive Evaluation, NDEs, principles and methods are introduced and case studies are examined. Performance modeling alternative methods are reviewed. Example and analysis of GHG mitigation strategies and carbon sequestration techniques for infrastructure materials and structures are introduced. Development of sustainable rehabilitation methods applied to civil infrastructure are covered as well.
Prerequisite: MATH140 .
Credit Only Granted for: ENCE489G or ENCE404.
Formerly: ENCE489G.

ENCE405 Sustainability, Thermal Comfort & Urban Heat Islands (3 Credits)
Sustainability principles applied to urban areas. Methods and analysis for urban heat islands. Heat balance analysis. Surface albedo assessment techniques. Thermal comfort principles and analysis methods. Alternative materials and permeable/ impermeable surface materials for GHG reduction and UHI. Safety assessment of sustainable roadways: principles and measurements.
Prerequisite: MATH140 .
Credit Only Granted for: ENCE489I or ENCE405.
Formerly: ENCE489I.

ENCE411 Environmental Engineering Science (3 Credits)
Introduces the analytical techniques available to assess performance of engineering processes as they relate to water, soil, and air treatment and quality. The basic principles of environmental management, economics of waste treatment, by-product reutilization, and energy cycles are introduced and discussed. Alternative technologies are introduced and evaluated mostly by assessing their potential to reduce waste, minimize energy use, and promote sustainability. Students' activities include, a weekly lab to provide hands-on experience with environmental quality measurements and treatment techniques; on-site visits to regional industries that undertake sustainable practices; and a final research project where experimental design and laboratory techniques are used to assess interactions between technologies and natural systems and their potential for reducing environmental impacts.
Prerequisite: ENCE205 and ENCE310; and permission of ENGR-Civil & Environmental Engineering department.

ENCE412 Environmental Engineering Unit Operations (3 Credits)
Examination of unit operations and processes encountered in environmental engineering field. Fundamental principles learned from previous classes will be applied into the design and operation of unit operations and processes, particularly in the area of water and wastewater treatment. Similar processes will be applied to air pollution control, solid waste disposal and hazardous waste treatment.
Prerequisite: ENCE305 and ENCE310; and permission of ENGR-Civil & Environmental Engineering department.

ENCE420 Selection and Utilization of Construction Equipment (3 Credits)
Learn to evaluate and select construction equipment with a focus on mechanized equipment for earthwork and building construction.Learn about the parties involved in procurement, operation and maintenance, and how to cost-effectively plan, select, and utilize equipment for earthmoving, paving, formwork, trenching, rock excavation, tunneling, site preparation, and steel and concrete construction. Explore trends in equipment design, construction automation, and robotics.
Prerequisite: Permission of ENGR-Civil & Environmental Engineering department.
Restriction: Must be in a major in ENGR-A. James Clark School of Engineering; or must be in the Construction Project Management minor.

ENCE421 Legal Aspects of Architectural and Engineering Practice (3 Credits)
Learn the basic structure of the US legal system and court procedures and legal principles relevant to architectural and engineering design and construction contracts including principles of ethical, legal and professional conduct of engineers and architects.Topics include: contracts for design and construction, sales and warranties, torts and product liability, business agency and government agencies, professional liability of architects and engineers, labor laws, expert testimony, mediation and arbitration, tangible property including real estate, intellectual property including trademarks, patents and copyrights, insurance and sureties.
Restriction: Must be in a major in ENGR-A. James Clark School of Engineering; or must be in the Construction Project Management minor; or must be in the Project Management Minor. And permission of ENGR-Civil & Environmental Engineering department.

ENCE422 Project Cost Accounting and Economics (3 Credits)
Learn: the fundamentals of accounting; project cost accounting principles as they apply to project management; project cost accounting; and the fundamentals of engineering economics.Topics include: project feasibility analysis; reading and analyzing financial statements; cash management; cash flow analysis; depreciation and taxes; and impact on profitability; the principles of activity based costing; net present value analysis; the framework for project performance measurement, cost performance indices, and earned value analysis.
Prerequisite: Permission of ENGR-Civil & Environmental Engineering department.
Restriction: Must be in a major in ENGR-A. James Clark School of Engineering; or must be in the Construction Project Management Minor; or must be in the Project Management Minor.

ENCE423 Project Planning, Estimating & Scheduling (3 Credits)
Learn the fundamentals of project planning, estimating, and scheduling. Understand the concepts of planning; to reduce uncertainty, improve efficiency of the operation, to set and meet objectives, and to provide a basis for monitoring and controlling the work. Be introduced to: the concepts of resource definition, assignment and management, and; the basics of project estimating (pricing) methods including global pricing strategies, types of estimates, pricing processes, overhead and profit, and project financing.Learn the basics of project scheduling including; bar charts, network-based methodologies, and linear scheduling techniques. Emphasis is placed on Critical Path Method (CPM) scheduling, a network based methodology. Be exposed to the use of scheduling software and will actually develop a CPM schedule for an actual construction project as part of a semester project.
Restriction: Must be in a major in ENGR-A. James Clark School of Engineering; or must be in the Construction Project Management Minor; or must be in the Project Management Minor. And permission of ENGR-Civil & Environmental Engineering department.

ENCE424 Communication for Project Managers (3 Credits)
Learn the fundamentals of communications for project managers. Emphasis is on interpersonal and group communications; through voice, electronic, and written messages; project cycle and reports and presentations during this cycle; and communications for employment.
Prerequisite: Permission of ENGR-Civil & Environmental Engineering department.
Jointly offered with: ENCE614.
Restriction: Must be in a major in ENGR-A. James Clark School of Engineering; or must be in the Construction Project Management minor; or must be in the Project Management minor.
Credit Only Granted for: ENCE424 or ENCE614.

ENCE426 Construction Documentation and BIM Applications in Engineering and Construction (3 Credits)
Learn the basics of construction documentation methods, with particular emphasis on Building Information Modeling (BIM). Topics include: the fundamentals of assembly, coordination, and maintenance of construction documents and implementation of BIM techniques in the design and construction processes, and; a review of Autodesk, Revit, and Navisworks and other leading BIM software. Lectures from project management faculty supplemented by guest lecturers from the construction industry.
Prerequisite: Permission of ENGR-Civil & Environmental Engineering department.
Restriction: Must be in a major in ENGR-A. James Clark School of Engineering; or must be in the Construction Project Management Minor; or must be in the Project Management Minor.

ENCE430 Introduction to Infrastructure and Resilience (3 Credits)
Develops system-level skills for the planning, design, maintenance, and operation of resilient infrastructure systems. Through this course, we will discuss a variety of infrastructure systems, both public and private, and their role in communities before and after disasters. The themes of the course will be grounded in the four phases of emergency management (mitigation, preparedness, response, and recovery) and the role that infrastructure plays in each. Through these applications areas, we will study a variety of conceptual, analytical, and computational models that support informed decision-making for these systems under uncertainty.
Prerequisite: ENCE302; or students who have taken courses with comparable content may contact the department.
Corequisite: ENCE360; or students who have taken courses with comparable content may contact the department. Jointly offered with ENCE632.
Credit Only Granted for: ENCE632, ENCE688U, ENCE430 or ENCE489U.
Formerly: ENCE489U.

ENCE431 Hydrologic Engineering (3 Credits)
An introduction to basic principles of hydrologic science including the hydrologic cycle, rainfall, surface runoff and streamflow. Special emphasis is placed on hydrologic engineering design of stormwater management and flood control facilities. Design projects are used to illustrate design practices.
Prerequisite: ENCE305; and permission of ENGR-Civil & Environmental Engineering department.

ENCE432 Ground Water Hydrology (3 Credits)
Concepts related to the development of the ground water resources, hydrology, hydrodynamics of flow through porous media, hydraulics of wells and basin-wide ground water development. Fundamentals of ground water pollution are introduced.
Prerequisite: ENCE305; and permission of ENGR-Civil & Environmental Engineering department.

ENCE436 Environment and Water II: Water Management (3 Credits)
Covers the essential principles and practices of water resources management, focusing on the sustainable design and operation of water systems. Students will examine key topics such as hydrology, stormwater management, groundwater flow, and water quality. Through hands-on projects, students will design water supply systems, flood management strategies, and stormwater management plans while considering economic, legal, and environmental factors. The course emphasizes the integration of technical and governance aspects in managing water resources to address global water challenges and prepare students for professional practice.
Prerequisite: Minimum grade of C- in ENCE336 and ENCE305.
Restriction: Permission of the ENGR-Civil & Environmental Engineering Department.

ENCE441 Foundation Design (3 Credits)
Critical review of classical lateral earth pressure theories, analysis of retaining walls and reinforced earth walls, subsurface explorations, bearing capacity and settlement of shallow foundations, design of deep foundations that includes both pile foundations and drilled shafts.
Prerequisite: ENCE340; and permission of ENGR-Civil & Environmental Engineering department.

ENCE442 Structural Analysis and Design II (3 Credits)
Introduces students to the structural design process, with a focus on decision-making using design codes and standards. Students will apply design methods to reinforced concrete, steel, and mass timber structures, considering life-cycle costs, sustainability, and environmental impacts. The course will cover design loads, load-resisting systems, and the principles of reinforced concrete and steel design.
Prerequisite: Minimum grade of C- in ENCE342; and must have completed or be concurrently enrolled in ENCE340.
Restriction: Permission of the ENGR-Civil & Environmental Engineering Department.

ENCE444 Experimental Methods in Geotechnical Structural Engineering (3 Credits)
In the geotechnical engineering part of the course, major soils testing and their interpretation including classification, compaction, strength, and compressibility will be undertaken. The structural engineering part of this course covers test planning, loading apparatus, instrumentation, data acquisition and data analysis, as well as basic aspects of structural testing techniques and shake-table test.
Prerequisite: ENCE353 and ENCE340; and permission of ENGR-Civil & Environmental Engineering department.

ENCE447 Pavement Engineering (3 Credits)
Fundamental principles underlying the design, construction, maintenance and repair, and management of highway and airfield pavement systems. Pavement performance (functional/structural; evaluation); pavement mechanics (multi-layered elastic theory; slab theory); pavement materials (properties and characterization); environmental effects; current rigid and flexible design methods (new/rehabilitation); construction (new construction; maintenance/repair; rehabilitation); economic evaluation; pavement management.
Prerequisite: ENCE340; and permission of ENGR-Civil & Environmental Engineering department.

ENCE451 Design of Timber Structures (4 Credits)
Mass timber refers to a family of engineered wood products of large section size that provide the construction industry with a sustainable and viable alternative to steel and concrete. This course introduces students to the design of mass timber structures, a cutting-edge and eco-friendly building technology. Topics include the analysis and design of dimensional lumber and mass timber components such as Cross-Laminated Timber (CLT) and Glued Laminated Timber (Glulam). Specific focus areas include: Tension members; Beams (flexural members); Columns; Floor diaphragms; Shear walls; Connections; Fire-resistance design and acoustic considerations in the design. The course adopts a project-based learning approach to foster practical understanding and application.
Prerequisite: ENCE353 or another course that provides the relevant structure analysis required content; and permission of the ENGR-Civil and Environmental Engineering department.
Credit Only Granted for: ENCE689W or ENCE451.

ENCE453 Computer-Aided Structural Analysis (3 Credits)
Computer-aided analysis of structural systems. Unified matrix formulation of stiffness and flexibility methods. Slope deflection method. Evaluation of truss, frame, and grid systems. Non-prismatic and curved elements. Error analysis and determination of ill-conditions. Introduction to finite element methods; formulation of simple two-dimensional elements. In laboratory, use and development of CAD software.
Prerequisite: ENCE353; and permission of ENGR-Civil & Environmental Engineering department.

ENCE454 Design of Concrete Structures (3 Credits)
Combined bending and compression, development and anchorage of reinforcement, deflections, design of slabs including one-way and two-way, design of footings, retaining walls, introduction to prestressed concrete, design of multi-story buildings.
Prerequisite: ENCE353; and permission of ENGR-Civil & Environmental Engineering department.
Formerly: ENCE451.

ENCE455 Design of Steel Structures (3 Credits)
Behavior and design of members subjected to fatigue, and combined bending and compression; plate girders, composite beams, open-web joists and connections. Methods of allowable stress design, and load and resistance factor design. Elements of plastic analysis and design. Framing systems and loads for industrial buildings and bridges.
Prerequisite: ENCE353; and permission of ENGR-Civil & Environmental Engineering department.

ENCE464 Civil and Environmental Engineering Design I (2 Credits)
This experiential course provides structured and unstructured time for group work as part of the senior capstone design course. The course gives students a chance to practice the skills acquired throughout a student's academic career. The course provides students with hands-on experience similar to the experience encountered by new engineers in professional engineering and construction practice. The course offers students an opportunity to develop the leadership and group work skills needed to meet professional expectations.
Prerequisite: Minimum grade of C- in ENCE367, ENCE356, ENCE336, and ENCE342.
Restriction: Permission of the ENGR-Civil & Environmental Engineering Department.
Credit Only Granted for: ENCE465 or ENCE464.
Formerly: ENCE465.
Additional Information: Must be taken in the last year.

ENCE465 Civil and Environmental Engineering Design I (1 Credit)
Provides students an opportunity to develop their skills in project scoping and the development of design proposals. The fundamental concepts are taught using analytical and computational methods, which are necessary for designing and analyzing the sustainability of various engineering processes and technologies. The course provides the methods and skills for understanding the human-environment-infrastructure interactions needed to develop a design proposal.
Prerequisite: ENCE201 and ENCE215.
Restriction: Permission of the ENGR-Civil & Environmental Engineering Department.

ENCE467 Civil and Environmental Engineering Design II (2 Credits)
This experiential course provides structured and unstructured time for groupwork as part of the senior capstone design course sequence. The course builds on skills acquired throughout a student's academic career extending a project defined and scoped in ENCE465. The objective of this course is to provide students with hand's on experience similar to the experience encountered by new engineers working in professional engineering and construction practice. The course offers students an opportunity to develop the leadership and groupwork skills needed to meet professional expectations.
Prerequisite: ENCE465; and must have completed or be concurrently enrolled in ENCE302 and ENCE305.
Restriction: Permission of the ENGR-Civil & Environmental Engineering Department.

ENCE470 Highway Engineering (3 Credits)
Highway location and design, highway engineering economics, traffic engineering, traffic measurement devices and technologies. Includes discussion of technological advances in traffic flow and capacity, such as signal systems, corridor control, automatic driver information, incident detection and autonomous vehicle operation.
Prerequisite: ENCE302 and ENCE370; and permission of ENGR-Civil & Environmental Engineering department.

ENCE472 Transportation Engineering (3 Credits)
Transportation engineering concepts including transportation systems analysis, airport systems, airline and airport operations, marine transportation and urban public transportation systems.
Prerequisite: ENCE302 and ENCE370; and permission of ENGR-Civil & Environmental Engineering department.

ENCE482 Innovations in Materials and Technologies for Future Civil Infrastructure (3 Credits)
The future of civil infrastructure depends on novel materials that are stronger, smarter, and more sustainable, as well as new construction technologies that are faster, more reliable, and less labor-intensive. This course explores the latest breakthroughs in civil engineering materials and technologies. Students will explore how cutting-edge materials and construction technologies are transforming the civil engineering practice. Through lectures, assignments, hands-on demonstrations, and projects, students gain the skills to innovate, design, and implement next-generation materials and technologies that help to tackle the urgent challenges in sustainable and digital civil infrastructure.
Prerequisite: Minimum grade of C- in ENCE300; and permission of the ENGR-Civil & Environmental Engineering department.
Jointly offered with: ENCE682.
Credit Only Granted for: ENCE482 or ENCE682.

ENCE483 Transportation Systems II (3 Credits)
Introduces students to the characteristics, design, and analysis of various transportation systems, including roads, railways, urban transit, air transportation, and marine transportation. Students will explore the infrastructure and vehicles for passenger and freight transportation across different modes. The course covers topics in the geometric design of transportation systems, performance evaluation, system modeling, and optimization. Students will apply optimization, statistical, and economic analysis methods in designing and operating transportation systems.
Prerequisite: Minimum grade of C- in ENCE383.
Restriction: Permission of the ENGR-Civil & Environmental Engineering Department.

ENCE489 Special Problems in Civil Engineering (1-4 Credits)
A course arranged to meet the needs of exceptionally well prepared students for study in a particular field of civil engineering.
Prerequisite: Permission of ENGR-Civil & Environmental Engineering department.
Restriction: Senior standing.
Repeatable to: 9 credits if content differs.

ENEB - Cyber-Physical Systems Engineering

ENEB302 Analog Circuits (4 Credits)
Foundations of circuits, focusing on applications including signal amplification, power amplification, instrumentation and filters. Fundamental concepts of analog circuits including analysis methods in time and complex domains, with emphasis on circuit topologies relevant in embedded systems. Intensive application of simulations and hands-on laboratory exercises.
Prerequisite: Minimum grade of C- in PHYS260 and PHYS261; and 1 course with a minimum grade of C- from (MATH246, MATH241, MATH240); and permission from the Cyber-Physical Systems Engineering program required.
Restriction: Must be in the Cyber-Physical Systems Engineering program.

ENEB304 Microelectronics and Sensors (3 Credits)
An overview of basic Internet of Things (IOT) architecture, core IOT hardware enablers, and IOT sensors and their implementation. This course covers commonly used analog amplifier designs and biasing, as well as characterization in the frequency and time domains. In addition, this course discusses the physical principles in RF communications as it relates to wireless personal and local networks (WPAN/WLAN) and short-range communication systems.
Prerequisite: Minimum grade of C- in ENEB302; and permission from the Cyber-Physical Systems Engineering program required.
Restriction: Must be in the Cyber-Physical Systems Engineering program.

ENEB340 Intermediate Programming Concepts and Applications for Embedded Systems (3 Credits)
Principles of programming for embedded systems development. Includes principles of software development in Unix, C and other high level languages, input/output, data types and variables, operators and expressions, program selection, repetition, functions, arrays, strings, introduction to algorithms, software projects, debugging, documentation. Includes hands-on applications in microprocessor environments.
Prerequisite: Completion of approved introductory programming course with a minimum grade of a "C-"; and permission of the Cyber-Physical Systems Engineering program required.
Restriction: Must be in the Cyber-Physical Systems Engineering program.

ENEB341 Introduction to Internet of Things (3 Credits)
An introduction to the foundations of Internet of Things (IoT), including IoT devices, communications, connection considerations, back-end services/applications, and business models. This course looks at the IoTs as the general theme of physical/real-world things becoming increasingly visible and actionable via Internet and Web technologies. It also covers networking protocols and gateways, security and privacy, data analytics and cloud computing platforms.
Prerequisite: Permission from the Cyber-Physical Systems Engineering program.
Restriction: Must be in the Cyber-Physical Systems Engineering program.

ENEB344 Digital Logic Design for Embedded Systems (4 Credits)
Hands on approach on foundations of digital logic for embedded systems applications; including input/output, logic gates, Karnaugh maps, latches, flip-flops and state-machines. This course also covers design and analysis of synchronous sequential systems, implementation with PLA's, multiplexers, decoders, encoders, binary arithmetic units such as adders and subtractors, conversions between decimal and arbitrary radix numbers, especially octal, hexadecimal, and binary representations, radix and diminished radix arithmetic, and character codes.
Corequisite: ENEB340; and permission from the Cyber-Physical Systems Engineering program.
Restriction: Must be in the Cyber-Physical Systems Engineering program.

ENEB345 Probability & Statistical Inference (3 Credits)
This is a foundational course on probability and statistics for data science and connected embedded systems. This covers basic statistics and probability theory, including random variables, standard distributions, moments, law of large numbers and central limit theorem, sampling methods, estimation of parameters, testing of hypotheses. The course also includes the mathematical theory of randomness, and applications to big data analysis and analysis in the presence of uncertainty, and applications to machine learning algorithms.
Prerequisite: MATH141.
Restriction: Must be in the Embedded Systems & Internet of Things program; and must receive permission from the Embedded Systems & Internet of Things program.

ENEB346 Linear Algebra for Machine Learning Applications (3 Credits)
Foundations of linear algebra for machine learning and data science applications with emphasis on implementing machine learning data science algorithms in a computer programming environment with linear algebra software tools and libraries as this course aims to provide a hands-on experience and learning environment for students. Students will learn the fundamental concepts in linear algebra that are directly relevant to machine learning and big data modeling and computations. These include vector and matrix operations, determinants, factorization methods, principal component analysis, eigenvalues, and singular value decomposition.
Prerequisite: MATH140.
Restriction: Must be in the Cyber-Physical Systems Engineering program and must receive permission from the Cyber-Physical Systems Engineering program.

ENEB352 Introduction to Networks and Protocols (3 Credits)
An introduction to the principles of computer networking and covers the architecture and operation of the TCP/IP protocol stack. Topics will include fundamental networking concepts, the layers of the TCP/IP protocol stack, the packet structure and operation of each layer with detailed discussion on reliable data transfer, flow control, congestion control, routing algorithms, error detection, Local Area Networks (LANs), and multiple access protocols. The course will also cover wireless protocols relevant to Internet of Things (IoT) such as WLAN (IEEE 802.11), Zigbee (IEEE 802.15.4), and Bluetooth as well as some popular IoT application-layer and network-layer protocols including CoAP, AMQP, MQTT, XMPP and 6LoWPAN. As a part of the course work, the students will attend lab sessions where they will learn how to capture and analyze network traffic, how to configure networking functions on Linux systems, and how to operate and configure routers using Juniper Networks devices in a real-world lab environment.
Prerequisite: Minimum grade of C- in ENEB341; and permission from the Cyber-Physical Systems Engineering program.
Restriction: Must be in the Cyber-Physical Systems Engineering program.

ENEB353 Computer Organization for Embedded Systems (3 Credits)
Overview of the basic principles of computer organization and design with emphasis on low resource microcontrollers common in IoT applications. The topics include assembly and machine instructions, data-path and controller design, pipelining and memory hierarchy.
Prerequisite: Minimum grade of C- in ENEB344 and ENEB354; and permission from the Cyber-Physical Systems Engineering program.
Restriction: Must be in the Cyber-Physical Systems Engineering program.

ENEB354 Discrete Mathematics for Information Technology (3 Credits)
Foundations of discrete mathematics for information technology and embedded computing. Topics include sets, relations, functions and algorithms, proof techniques and induction, number theory, counting and combinatorics, and Graph theory.
Prerequisite: Minimum grade of C- in MATH141.
Restriction: Must be in the Cyber-Physical Systems Engineering program.

ENEB355 Algorithms in Python (3 Credits)
A study of fundamental algorithmic problem-solving techniques in Python for today's large-scale computer systems as well as microcontrollers. Algorithms are instructions for solving problems and data structures are strategies for organizing information on computers. Efficient algorithms require appropriate data structures, and vice versa. Students will learn about the algorithms and data structures that form the building blocks of Python programming language. Student will also learn to analyze the cost of algorithms, according to how their running time or space requirements grows as data size grows.
Prerequisite: Minimum grade of C- in ENEB340 and ENEB354; and permission from the Cyber-Physical Systems Engineering program.
Restriction: Must be in the Cyber-Physical Systems Engineering program.
Credit Only Granted for: ENEB355 or ENBC322.

ENEB408 Capstone Design Lab (3 Credits)
This course is the first of a two-semester sequence of capstone design laboratory experiences required for Cyber-Physical Systems Engineering students. Students will learn the principles of design, project planning, and project management. They will develop an ability to apply engineering solutions considering public health, safety, and welfare. Students will develop a consciousness of ethical and professional responsibilities and recognition of global, cultural, social, environmental, and economic factors in the design process. Students will also develop an ability to communicate in written and oral forms and to function effectively on a team. Projects will involve hardware, including a combination of off-the-shelf and custom-made components supported by hardware descriptive language software. The projects meet specific design challenges with applications in industry, healthcare, transportation, environmental sensing, cyber-security, and machine learning.
Prerequisite: Minimum grade of C- in all required 300-level ENEB courses.
Restriction: Must be in the Cyber-Physical Systems Engineering program; and must receive permission from the Cyber-Physical Systems Engineering program.
Repeatable to: 6 credits.

ENEB443 Hardware/Software Security for Embedded Systems (3 Credits)
This course will provide an in-depth understanding of systems level software and hardware in designing industry-standard secured embedded systems. It aims to provide a comprehensive systems view of security, including hardware, platform software such as operating systems and integrated development environments, software development process, data protection protocols, and some aspects of cryptography. To goal is to expose students on how to develop embedded software and properly utilize platform components to ensure the highest levels of security.
Prerequisite: Permission from the Cyber-Physical Systems Engineering program; and minimum grade of C- in ENEB454.
Restriction: Must be in the Cyber-Physical Systems Engineering program.

ENEB444 Operating Systems for Embedded Systems (3 Credits)
Theory, design, implementation and analysis of low-resource computer operating systems for IoT applications. Through classroom lectures, homework, and projects, students learn the fundamentals of concurrency, process management, interprocess communication and synchronization, job scheduling algorithms, memory management, input-output devices, file systems, and real-time operating systems. Optional topics may include communications protocols and computer security.
Prerequisite: Minimum grade of C- in ENEB340 and ENEB344; and permission from the Cyber-Physical Systems Engineering program.
Restriction: Must be in the Cyber-Physical Systems Engineering program.

ENEB451 Network Security (3 Credits)
The foundations of modern cryptography including IoT security aspects, IoT features leading to security issues, as well as design considerations. Various cryptographic algorithms are discussed including the lightweight cryptography used in IoT applications. We will focus on the technology advances, industrial standards, and law enforcement that have been or have to be made to establish trust in four key areas to establish the trust in computing: security, privacy, reliability, and business integrity. Students will implement cryptographic algorithms using industry-standard tools and programming languages. Furthermore, students will analyze various encryption algorithms using cryptanalysis tools.
Prerequisite: Minimum grade of C- in ENEB352.
Restriction: Must be in the Cyber-Physical Systems Engineering program and must receive permission from the Cyber-Physical Systems Engineering program.

ENEB452 Advanced Software for Connected Embedded Systems (3 Credits)
Hardware and software foundations, evaluations and validation, application mapping, optimization and testing of cyber-physical systems, namely, embedded systems and communication technologies.
Prerequisite: Minimum grade of C- in ENEB454; and permission from the Cyber-Physical Systems Engineering program.
Restriction: Must be in the Cyber-Physical Systems Engineering program; and senior standing.

ENEB453 Web-Based Application Development (3 Credits)
Introduction to cloud computing, computer programming in the context of developing full-featured dynamic websites. Uses a problem-solving approach to teach basics of program design and implementation using JavaScript; relates these skills to the creation of dynamic websites; then explores both the potential and limits of web-based information sources for use in research. This course provides a practical introduction to full-stack web development using PHP and JavaScript. The course will start with HTML/CSS/JavaScript to cover the client-side of applications. Then, it will move on to the server-side with PHP and integrating with a MySQL database to create a complete web application.
Prerequisite: ENEB340 and ENEB341.
Restriction: Must be in the Cyber-Physical Systems Engineering program; and permission of the Cyber-Physical Systems Engineering program.

ENEB454 Embedded Systems (3 Credits)
This course will provide students with the essential knowledge base that will enable them to tackle complex problems encountered in embedded systems design. The course will provide an overview of associated hardware components and software methodologies as well as the tools used in the development of modern embedded systems. Student will be exposed to the theoretical foundations which will be reinforced with carefully selected hands-on laboratory exercises, thereby getting a sense of how the theoretical concepts connect with the real-world embedded systems applications.
Prerequisite: Minimum grade of C- in ENEB353; and permission from the Cyber-Physical Systems Engineering program.
Restriction: Must be in the Cyber-Physical Systems Engineering program.

ENEB455 Advanced FPGA System Design using Verilog for Embedded Systems (3 Credits)
A project-oriented course on digital system design using Verilog hardware description language (HDL) in an industry-standard design environment appropriate for embedded systems. Students will implement real-world designs in field programmable gate arrays (FPGAs) as well as test and optimize the FPGA. Students will also work in teams on multiple, medium-scale digital system design projects and make oral presentations and written reports.
Prerequisite: Minimum grade of C- in ENEB344 and ENEB340; and permission from the Cyber-Physical Systems Engineering program.
Restriction: Must be in the Cyber-Physical Systems Engineering program.

ENEB456 Machine Learning Tools (3 Credits)
A broad introduction to machine learning and statistical pattern recognition tools. The course will teach students to model existing data and to forecast future behaviors, outcomes, and trends. It will be taught using the Azure Machine Learning Studio that provides an integrated, end-to-end data science and advanced analytics solution. It will enable students to prepare data, develop experiments, and deploy models at cloud scale. Topics include: supervised learning (Bayesian learning and classifier, parametric/non-parameteric learning, discriminant functions, support vector machines, neural networks, deep learning networks); unsupervised learning (clustering, dimensionality reduction, auto-encoders). The course will also discuss recent applications of machine learning, such as computer vision, data mining, autonomous navigation, and speech recognition. Hands-on: implementation of Tensorflow Algorithm on TPU board.
Prerequisite: ENEB345 and ENEB346.
Restriction: Must be in the Cyber-Physical Systems Engineering program.

ENEB457 Foundations of Databases for Web Applications (3 Credits)
An introduction to database systems and its applications to the Internet. It develops the database approach as a means to model the real world. The course will cover the fundamentals of the relational model, structured query language (SQL), data modeling, and database administration. This will cover an in-depth coverage of the relational model, logical database design, query languages, and other DB concepts including query optimization, concurrency control, transaction management, and log based crash recovery. In addition, students will be exposed to web-based database processing, data warehouse structures and fundamental concepts of nonrelational structured data storage (Big Data). Concepts will be illustrated with well-known Database Management System (DBMS) products such as MS Access, MS SQL Developer, Oracle Database XE, and MySQL Community Server.
Prerequisite: Must have completed or be concurrently enrolled in ENEB345 and ENEB355; and permission from the Cyber-Physical Systems Engineering program.
Restriction: Must be in the Cyber-Physical Systems Engineering program.

ENEB499 Senior Research Projects in Embedded Systems & Internet of Things (1-5 Credits)
Provides students in the Cyber-Physical Systems Engineering program with an opportunity to engage in independent research projects on advanced embedded systems topics. Projects are selected by students and supervised by faculty and other qualified mentors. While students may be required to acquire new skills or information in the course of completing an ENEB499 project, the focus is to conduct an independent investigation of a technical theme by the student.
Prerequisite: Permission of the Cyber-Physical Systems Engineering program.
Restriction: Must be in the Cyber-Physical Systems Engineering program.
Repeatable to: 5 credits if content differs.

ENED - Engineering Education

ENED101 Exploring Engineering Majors (1 Credit)
Designed to expose students to all engineering majors and assist them in narrowing down which engineering major they want to pursue. Students will self reflect, conduct interviews and tour engineering facilities to get a better understanding of what major their interests align with the most.
Restriction: Must be an undecided Engineering (09000) student in the Clark School of Engineering.
Additional Information: .

ENED115 Flexus & Virtus Seminar I: Transitions & Engineering Identity Development (1 Credit)
This is the first in a series of four seminars that students participating in the Dr. Marilyn Berman Engineering Living-Learning Programs: Flexus and Virtus. Transitions & Engineering Identity Development is designed to introduce students to the engineering discipline at the University of Maryland. Students will become acquainted with various resources and will be exposed to topical areas that aim to facilitate the transition into the university. Students will enhance technical and critical thinking skills through workshops and in-class activities. Encourages students to expand upon and balance their interpersonal, academic and technical skills through group work, in-class discussions, reflections, out-of-class activities and interacting with engineering mentors and role models.
Restriction: Must be in one of the Dr. Marilyn Berman Engineering Living-Learning Programs: Flexus or Virtus.
Credit Only Granted for: ENED115, ENES113, or ENES115.
Formerly: ENES113 or ENES115.

ENED215 Flexus & Virtus Seminar III: Introduction to Engineering Culture & Leadership (1 Credit)
This is the third in a series of four seminars for students participating in the Dr. Marilyn Berman Engineering Living-Learning Programs: Flexus and Virtus. The purpose of the course is to enhance students' awareness of issues within society at large and the engineering field in particular. By exploring the historical and cultural factors that inform the current state of engineering, this course aims to help students develop a deeper understanding of how different groups experience and navigate the field of engineering. Through critical dialogue, reflection, and in-class activities, students will develop self-awareness; cultivate a consciousness of different dynamics of culture, power, and privilege; examine and critique different perspectives; and identify and analyze different forms of bias.
Prerequisite: ENED116, ENES114 or ENES116.
Restriction: Must be in one of the Dr. Marilyn Berman Engineering Living-Learning Programs: Flexus or Virtus.
Credit Only Granted for: ENED215, ENES213 or ENES215.
Formerly: ENES213 or ENES215.

ENED290 Introduction to Design and Quality (4 Credits)
The first QUEST course introduces foundational principles of design and quality, emphasizing their impact on product development and customer satisfaction. Working in multidisciplinary teams, students will explore design thinking, project management techniques, and quality tools, applying these frameworks to real-world product redesigns and innovations.
Cross-listed with: BMGT290.
Restriction: Must be in the Quest program.
Credit Only Granted for: BMGT190, ENES190, ENED290, or BMGT290.
Formerly: BMGT190 and ENES190.

ENED390 Designing Innovative Systems (3 Credits)
The QUEST systems thinking course challenges students to analyze how processes interact in larger systems. Students will learn how to use process improvement tools and a systems thinking approach to solve problems and design innovative solutions. By drawing upon their multidisciplinary backgrounds, students will be able to understand and reframe problems from multiple perspectives to uncover new solutions.
Prerequisite: ENES190, BMGT190, ENED290 or BMGT290.
Cross-listed with: BMGT390.
Restriction: Must be in the QUEST program.
Credit Only Granted for: BMGT390, ENES390 or ENED390.
Formerly: ENES390.

ENED394 Applied Quantitative Analysis (3 Credits)
The QUEST data analysis course takes a human-centered approach to data analysis and focuses on teaching students how to frame the core problem, choose the right data, and uncover deep insights from data to build an understanding of people and expose opportunities for innovation. Students will use visualization and statistical techniques to explore data, generate insights, and share the human stories behind the data to move people to action.
Cross-listed with: BMGT394.
Restriction: Must be in the QUEST Program.
Credit Only Granted for: BMGT394, ENED394, ENES489A or BMGT438A.
Formerly: BMGT438A and ENES489A.

ENED396 Design and Innovation in Silicon Valley (3 Credits)
QUEST students will learn about design, innovation, and quality by studying the operations of Silicon Valley companies. This course will provide students with the opportunity to learn first-hand from a number of these organizations during visits over spring break.
Cross-listed with: BMGT396.
Restriction: Must be in the QUEST program.
Credit Only Granted for: BMGT396, ENED396, BMGT438G, or ENES489Q.
Formerly: BMGT438G or ENES489Q.

ENED397 Mentoring Multidisciplinary Teams (3 Credits)
QUEST mentors serve a valuable purpose in the program as they coach new cohorts of students progressing through BMGT/ENED290H. Mentors will learn and practice essential team-building and facilitation skills, including effective communication, conflict management, strengths-based leadership, and lesson planning. They will use these leadership skills to inspire their 290H teams and improve team performance.
Prerequisite: BMGT290 or ENED290.
Cross-listed with: BMGT397.
Restriction: Must be in the QUEST Program (TQMP).
Credit Only Granted for: BMGT397, ENES397 or ENED397.

ENED490 QUEST Capstone Professional Practicum (4 Credits)
The capstone course for the QUEST Honors Program provides students with an opportunity to learn in multidisciplinary teams of business, engineering, and science students in a real-world setting. Companies engage teams of QUEST students with real organizational challenges and dedicate resources to help students address these problems. Student teams must enhance their skills in quality management, process improvement, and systems design and will apply these to add value to a client. In the process, students will improve their teamwork skills.
Prerequisite: BMGT390, ENES390 or ENED390.
Cross-listed with: BMGT490.
Credit Only Granted for: BMGT490, ENES490 or ENED490.
Formerly: ENES490.

ENED491 Scoping Projects for Business Impact (3 Credits)
Students cultivate relationships with new and current corporate partners and prepare project scopes for QUEST courses. As part of the scoping process, students learn about techniques for reaching out to clients, assessing current relationships to determine how to approach an organization, pitching project sponsorship, and determining a project scope. The course includes independent work networking with clients and phone call and video discussions with potential clients.
Prerequisite: BMGT190, ENES190, ENED290 or BMGT290.
Cross-listed with: BMGT491.
Restriction: Must be in the QUEST Program (TQMP).
Credit Only Granted for: BMGT491, ENES491 or ENED491.
Formerly: ENES491.

ENEE - Electrical & Computer Engineering

ENEE101 Introduction to Electrical & Computer Engineering (3 Credits)
An exploration of topics within Electrical & Computer Engineering (ECE). Students will be introduced to key elements of both the Electrical Engineering and Computer Engineering curriculum, including: circuits, computing systems and software, communications and controls, electrodynamics and waves, microelectronics, signal processing, and power systems.
Corequisite: MATH140. And corequisite: ENEE140 or CMSC131; or a score of 5 on the A Java AP exam; or a score of 4 or 5 on the AB Java AP exam; or satisfactory performance on the department's placement exam.
Restriction: Must be in one of the following programs (Engineering: Electrical; Engineering: Computer) ; and students cannot enroll in ENEE101 and ENES100 in the same semester.
Credit Only Granted for: ENEE101 or ENEE301.

ENEE131 Technology Choices (3 Credits)
An exploration of the positive and negative effects of technology on society, via diverse criteria to assess the relative well being of individuals and society; an examination of how society can help shape the future of technology and the tools that can be used to make wise technology choices.

ENEE140 Introduction to Programming Concepts for Engineers (2 Credits)
Introduction to the programming environment: editing, compiling, UNIX, data types and variable scope; program selection, formatted/unformatted input/output, repetition, functions, arrays and strings.
Prerequisite: Permission of ENGR-Electrical & Computer Engineering department.
Restriction: Must be in Engineering: Electrical program; or must be in Engineering: Materials Science program.

ENEE150 Intermediate Programming Concepts for Engineers (3 Credits)
Advanced programming concepts: coding conventions and style; pointers; dynamic memory allocation and data structures; linked lists; graphs; abstract data types; object-oriented design. There will be team-based software projects and group presentations.
Prerequisite: Permission of ENGR-Electrical & Computer Engineering department. And ENEE140 or CMSC131; or score of 5 on the A Java AP exam; or score of 4 or 5 on the AB Java AP exam; or satisfactory performance on the department's placement exam.
Corequisite: MATH140.
Restriction: Must be in Engineering: Electrical program.

ENEE200 Technology and Consequences: Engineering, Ethics, and Humanity (3 Credits)
What makes a technology socially responsible? At UMD, the Fearless Ideas campaign asks us to aim our enthusiasm for technology at big real problems. At the same time, we are coming to appreciate the increasingly complex nature of technological systems as they become integrated into all forms of infrastructure, we realize they may be unpredictable, interdependent on social and biological systems, and have unintended consequences. In this midst of this complexity, people make decisions with far reaching impacts. How then do we follow our passion for technology and innovation but also stay skeptical in a way that allows us to consider the potential and shortcomings of technology? Designed for both engineering and non-engineering students wishing to explore and assess the impact of engineering technology on society and the role of society in generating that technology.
Credit Only Granted for: ENEE200 or ENES200.

ENEE205 Electric Circuits (4 Credits)
Design, analysis, simulation, construction and evaluation of electric circuits. Terminal Relationships. Kirchoff's laws. DC and AC steady state analysis. Node and mesh methods. Thevenin and Norton equivalent circuits. Transient behavior of first- and second-order circuits. Frequency response and transfer functions. Ideal op-amp circuits. Diode and transistor circuits.
Prerequisite: Minimum grade of C- in PHYS260; and minimum grade of C- in PHYS261; and permission of ENGR-Electrical & Computer Engineering department.
Corequisite: MATH246 or ENEE290.
Restriction: Must be in one of the following programs (Engineering: Computer; Engineering: Electrical).

ENEE222 Elements of Discrete Signal Analysis (4 Credits)
Discrete- and continuous-time signals, sampling of sinusoids. Discrete Fourier transform: properties and applications. Periodic signals and Fourier series. Discrete-time linear filters in time and frequency domains. Numerical applications and implementation of algorithms (using MATLAB).
Prerequisite: Minimum grade of C- in ENEE140; or minimum grade of C- in CMSC131; and permission of ENGR- Electrical & Computer Engineering department.
Corequisite: ENEE290; or coursework approved by the department.
Restriction: Must be in one of the following programs (Engineering: Electrical; Engineering: Computer).

ENEE244 Digital Logic Design (3 Credits)
The design and analysis of combinational and synchronous sequential systems comprising digital logic gates and flip-flop memory devices; underlying tools such as switching and Boolean algebras and Karnaugh map simplification of gate networks; design and use of decoders, multiplexers, encoders, adders, registers, counters, sequence recognizers, programmable logic arrays (PLAs), read-only memories (ROMS, PROMS), and similar devices. Arbitrary radix conversion.
Prerequisite: Must have completed or be concurrently enrolled in CMSC132 or ENEE150; and permission of ENGR-Electrical & Computer Engineering department.
Restriction: Sophomore standing or higher; and must be in one of the following programs (Engineering: Computer; Engineering: Electrical).

ENEE245 Digital Circuits and Systems Laboratory (2 Credits)
Introduction to basic measurement techniques and electrical laboratory equipment (power supplies, oscilloscopes, voltmeters, etc.). Design, construction, and characterization of digital circuits containing logic gates, sequential elements, oscillators, and digital integrated circuits. Introduction to digital design and simulation with the Verilog Hardware Description Language (HDL).
Prerequisite: Minimum grade of C- in ENEE244. And minimum grade of C- in ENEE150; or minimum grade of C- in CMSC132. And permission of ENGR-Electrical & Computer Engineering department.
Restriction: Must be in one of the following programs (Engineering: Electrical; Engineering: Computer).

ENEE290 Introduction to Differential Equations and Linear Algebra for Engineers (4 Credits)
First-order differential equations, matrices and systems of linear equations, finite-dimensional vector spaces, inner product spaces, eigenvalues and eigenvectors, linear differential equations of higher order, and systems of differential equations. This course covers important topics in mathematics for Electrical and Computer Engineers. Specifically, several topics are covered, including first-order differential equations, matrices and systems of linear equations, finite-dimensional vector spaces, inner product spaces, eigenvalues and eigenvectors, linear differential equations of higher order, and systems of differential equations. Theoretical topics presented in the lectures will be reinforced by laboratory exercises.
Prerequisite: Minimum grade of C- in MATH141; and permission of ENGR-Electrical & Computer Engineering department.
Restriction: Must be in one of the following programs (Engineering: Electrical; Engineering: Computer).
Credit Only Granted for: ENEE290, MATH240, MATH246, or MATH461.

ENEE301 Current Trends in Electrical and Computer Engineering (3 Credits)
A survey course on the current trends in Electrical and Computer Engineering (ECE). Students will be introduced to foundational knowledge of key technologies, providing them with technical information and a broad principled understanding of the relevance of these technologies to society. Students will acquire these knowledge bases through high-level lectures and hands-on experiential learning involving key technologies, including: energy generation and utilization, communication, advanced computing, information processing and machine intelligence, and autonomy.
Prerequisite: Minimum grade of C- in MATH140; and must have completed or be concurrently enrolled in ENEE140 or CMSC131; or a score of 5 on the A Java AP exam; or a score of 4 or 5 on the AB Java AP exam; or satisfactory performance on the department's placement exam.
Restriction: Junior standing or higher; and must be in Electrical Engineering or Computer Engineering; or permission of instructor.
Credit Only Granted for: ENEE101 or ENEE301.

ENEE303 Analog and Digital Electronics (3 Credits)
Conceptual operation of transistors and diodes. Large and small signal operation of BJTs and MOSFETs. Basic transistor configurations. Logic circuits and semiconductor memory. Multi-transistor circuits including differential amplifiers and current mirrors. Frequency response.
Prerequisite: Minimum grade of C- in ENEE205; and permission of ENGR-Electrical & Computer Engineering department.
Restriction: Must be in one of the following programs (Engineering: Electrical; Engineering: Computer).

ENEE304 Introduction to Micro and Nanoelectronics (3 Credits)
Introduction to semiconductor device physics: drift-diffusion model, pn junction properties, BJTs and FETs. Electronic circuits: diode circuits, BJT and MOSFET amplifiers, logic gates and multi-transistor circuits (such as differential amplifiers and current mirrors).
Prerequisite: Minimum grade of C- in ENEE205; and permission of ENGR-Electrical & Computer Engineering department.
Restriction: Must be in one of the following programs (Engineering: Electrical; Engineering: Computer).
Credit Only Granted for: ENEE304 or ENEE303; ENEE304 or ENEE313.

ENEE305 Introduction to Micro and Nanoelectronics Lab (2 Credits)
Introductory laboratory in semiconductors and electronics. Characterization of diodes followed by design and testing of analog and digital circuits at the transistor (FET and BJT) level.
Prerequisite: Minimum grade of C- in ENEE304; and permission of ENGR-Electrical & Computer Engineering department.
Restriction: Must be in the following program (Engineering: Electrical).
Credit Only Granted for: ENEE305 or ENEE307.

ENEE307 Electronic Circuits Design Laboratory (2 Credits)
Students will design and test analog and digital circuits at the transistor level. FETs and BJTs will be covered. The laboratory experiments will be tightly coordinated with ENEE303 materials.
Prerequisite: Minimum grade of C- in ENEE303; and permission of ENGR-Electrical & Computer Engineering department.
Restriction: Must be in one of the following programs (Engineering: Computer; Engineering: Electrical).

ENEE313 Introduction to Device Physics (3 Credits)
Basic physics of devices including fields in solids, crystal structure, properties of electrons and holes. Current flow in Si using drift-diffusion model. Properties of the pn junction. Properties of devices including BJTs, FETs and their physical characteristics.
Prerequisite: Minimum grade of C- in ENEE205; and permission of ENGR-Electrical & Computer Engineering department.
Restriction: Must be in one of the following programs (Engineering: Electrical; Engineering: Computer).

ENEE322 Signal and System Theory (3 Credits)
This is a course on signals and systems. The course lectures cover concepts in linear systems, and time and frequency domain analysis of signals and linear systems. Signal analysis topics: discrete- and continuous-time Fourier transforms, Laplace and z-transforms. Dynamical system properties: linearity, time-invariance, stability and invertibility. Analysis of linear time-invariant systems in the time domain (impulse response and convolution) and transform domain (transfer function and frequency response). Applications in signal processing, communications and control.
Prerequisite: Minimum grade of C- in MATH246 or ENEE290; and minimum grade of C- in ENEE222.
Restriction: Permission of ENGR-Electrical & Computer Engineering department. Must be in the following program (Engineering: Computer).
Credit Only Granted for: ENEE322 or ENEE323.

ENEE323 Signals and Systems: Theory and Applications (4 Credits)
This is a course and laboratory on signals and systems. The course lectures cover concepts in linear systems, and time and frequency domain analysis of signals and linear systems. Signal analysis topics: discrete- and continuous-time Fourier transforms, Laplace and z-transforms. Dynamical system properties: linearity, time-invariance, stability and invertibility. Analysis of linear time-invariant systems in the time domain (impulse response and convolution) and transform domain (transfer function and frequency response). Applications in signal processing, communications and control.
Prerequisite: Minimum grade of C- in MATH246 or ENEE290; and minimum grade of C- in ENEE222; and permission of ENGR-Electrical & Computer Engineering department.
Restriction: Must be in the following program (Engineering: Electrical).
Credit Only Granted for: ENEE322 or ENEE323.

ENEE324 Engineering Probability (3 Credits)
Axioms of probability; conditional probability and Bayes' rules; random variables, probability distribution and densities: functions of random variables: weak law of large numbers and central limit theorem. Introduction to random processes; correlation functions, spectral densities, and linear systems. Applications to noise in electrical systems, filtering of signals from noise, estimation, and digital communications.
Prerequisite: Minimum grade of C- in ENEE290 or MATH246; and minimum grade of C- in ENEE222; and permission of ENGR-Electrical & Computer Engineering department.
Restriction: Must be in one of the following programs (Engineering: Electrical; Engineering: Computer).
Credit Only Granted for: DATA400, STAT400 or ENEE324.
Additional Information: Electrical Engineering majors may NOT substitute STAT400 for ENEE324.

ENEE350 Computer Organization (3 Credits)
Structure and organization of digital computers. Registers, memory, control and I/O. Data and instruction formats, addressing modes, assembly language programming. Elements of system software, subroutines and their linkages.
Prerequisite: Minimum grade of C- in ENEE244; and 1 course with a minimum grade of C- from (ENEE150, CMSC132); and permission of ENGR-Electrical & Computer Engineering department.
Restriction: Must be in one of the following programs (Engineering: Computer; Engineering: Electrical).

ENEE351 Algorithms and Data Structures (4 Credits)
Introduction to fundamental concepts in computer engineering, including topics in discrete math, data structures and algorithms. The course will also include a hands-on programming component. This course will provide students with the tools to design modular, time and space-efficient algorithms for real-world problems.
Prerequisite: Minimum grade of C- in ENEE150 and ENEE244.
Restriction: Permission of ENGR-Electrical & Computer Engineering department; and must be in the Computer Engineering Minor or the Academy of Machine Learning.
Credit Only Granted for: ENEE351 or CMSC351.

ENEE359 Intermediate Topics in Computer Engineering (1-3 Credits)
Selected intermediate level topics in computer engineering.
Prerequisite: Must have earned a minimum grade of regular (letter) C- in all required 100- and 200-level ENEE courses; and permission of ENGR-Electrical & Computer Engineering department.
Restriction: Must be in one of the following programs (Engineering: Electrical; Engineering: Computer).
Repeatable to: 6 credits if content differs.

ENEE380 Electromagnetic Theory (3 Credits)
Introduction to electromagnetic fields. Coulomb's law, Gauss's law, electrical potential, dielectric materials capacitance, boundary value problems, Biot-Savart law, Ampere's law, Lorentz force equation, magnetic materials, magnetic circuits, inductance, time varying fields and Maxwell's equations.
Prerequisite: Minimum grade of C- in ENEE205; and minimum grade of C- in MATH241, PHYS270, and PHYS271; and permission of ENGR-Electrical & Computer Engineering department.
Restriction: Must be in Engineering: Electrical program.

ENEE381 Electromagnetic Wave Propagation (3 Credits)
The electromagnetic spectrum: Review of Maxwell's equations; the wave equation potentials, Poynting's theorem, relationship between circuit theory and fields; propagation of electromagnetic waves in homogeneous media and at interfaces; transmission line theory, waveguides, radiation and antennas.
Prerequisite: Minimum grade of C- in ENEE380; and permission of ENGR-Electrical & Computer Engineering department.
Restriction: Must be in Engineering: Electrical program.

ENEE382 Electromagnetics (4 Credits)
Theory and tools needed to solve electromagnetic problems and understand how electromagnetic waves propagate and interact with materials. Fields and potentials. Maxwell's equations and wave propagation. Reflection and transmission. Transmission lines. Antennas and radiation.
Prerequisite: Minimum of C- or better in ENEE205, MATH241, PHYS270, and PHYS271; and permission of ENGR-Electrical & Computer Engineering department.
Restriction: Must be in the Electrical Engineering program.
Credit Only Granted for: ENEE380 or ENEE382; ENEE381 or ENEE382.

ENEE396 Leadership, Creativity and Service Learning (3 Credits)
Introduction to engineering creativity and innovation in engineering. Application of creativity methods to topics in communication, service learning, teaching, research, and leadership. Discussions of leadership style, professional communication, and the handling of ethical dilemmas. Investigation of how experiential learning can enhance leadership and teamwork skills, connect to classroom learning and provide opportunities to gain practical experience.
Restriction: Must be in one of the following programs (Engineering: Computer; Engineering: Electrical).

ENEE407 Design & Testing of RF and Microwave Devices (2 Credits)
An introduction to state of the art design, and testing techniques of RF and microwave devices. Designs, simulations and layout of different devices are performed using the software package ADS (Advanced Design System). The course highlights a wide range of engineering applications including terrestrial microwave links, satellite communications, broadcasting, mobile communications and radar.
Prerequisite: Minimum grade of C- in ENEE381; and must have earned a minimum grade of regular (letter) C- in all required 200-level ENEE courses; and permission of ENGR-Electrical & Computer Engineering department.
Restriction: Must be in one of the following programs (Engineering: Computer; Engineering: Electrical) ; and permission of ENGR-Electrical & Computer Engineering department.

ENEE408 Capstone Design Project (3 Credits)
Culmination of prior course work in electrical and computer engineering. Utilization of modern design tools and methodologies for the design of components or systems under realistic constraints, with particular emphasis on teamwork and oral/written communication. Areas in which projects are currently offered include: microprocessor-based systems, digital systems, VLSI design (both digital and mixed-signal), and optical systems.
Prerequisite: Must have earned a minimum grade of regular (letter) C- in all required 200-level ENEE courses; and permission of ENGR-Electrical & Computer Engineering department.
Restriction: Must be in one of the following programs (Engineering: Computer; Engineering: Electrical).
Repeatable to: 6 credits if content differs.

ENEE411 Advanced Analog and Digital Electronics (3 Credits)
Examination of analog and digital device models for analysis, design, and simulation of transistor level electronic circuits, emphasizing Metal Oxide Silicon Field Effect Transistors (MOSFETs); fundamental single transistor configurations; frequency response, feedback, and stability of multi-transistor circuits, such as current mirrors, differential amplifiers, voltage references, operational amplifiers and data converters; complementary Metal Oxide Silicon (CMOS) implementations of static and clocked digital as well as mixed signal circuits.
Prerequisite: Minimum grade of C- in ENEE303 or ENEE304.
Restriction: Must be in one of the following programs (Engineering: Electrical; Engineering: Computer) ; and must have permission of the department.

ENEE413 Advanced Electronic Devices (3 Credits)
Advanced devices and their physical operation, providing a thorough description of those parts not usually covered in introductory electronics courses. These include Schottky and tunnel junctions, negative resistance devices used in wireless communication, homo-structure compound semiconductor transistors, hetero-structure (quantum effect) transistors, non-volatile memory devices, photonic devices such as LEDs and solid-state lasers, solar cells, photo-detectors and camera imagers, as well as bio-related components. Special consideration will be given to achieve an understanding of noise processes that limit electronic device performance. In all cases, system-level applications will be illustrated.
Prerequisite: Minimum grade of C- in ENEE313 or ENEE304.
Restriction: Must be in one of the following programs (Engineering: Computer; Engineering: Electrical) ; and permission of ENGR-Electrical & Computer Engineering department.

ENEE415 Advanced Manufacturing Laboratory (3 Credits)
An interdisciplinary course designed to provide students with an overview of key processes, technology, and manufacturing techniques involved in fabricating advanced devices and systems. Students will be exposed to state-of-the-art fabrication technologies, including soft lithography, 3D printing, hybrid manufacturing, material functionalization, and systems integration. In addition to developing a theoretical understanding in the classroom, students will gain hands-on fabrication and characterization experience of systems that can interface with complex environments.
Prerequisite: ENEE313 or ENEE304.
Restriction: Must be in the Department of Electrical and Computer Engineering.
Credit Only Granted for: ENEE415, ENEE419M, ENMA489M, or BIOE489J..
Formerly: ENEE419M.

ENEE416 Integrated Circuit Fabrication Laboratory (3 Credits)
Characterization of wafers and fabrication steps. Oxide growth, lithography, dopant diffusion, and metal deposition and patterning will be discussed in the lectures and carried out in the lab in fabricating NMOS transistor circuits. The transistor characteristics will be measured and related to the fabrication parameters.
Prerequisite: Minimum grade of C- in ENEE303 or ENEE304; and must have earned a minimum grade of regular (letter) C- in all required 200-level ENEE courses.
Restriction: Must be in one of the following programs (Engineering: Computer; Engineering: Electrical), and permission of ENGR-Electrical & Computer Engineering department.

ENEE417 Microelectronics Design Laboratory (2 Credits)
Students design and build fairly sophisticated circuits, mainly composed of discrete transistors and integrated circuits. Many of the projects are designed to require that students synthesize from what they have learned in many of the disciplines in electrical engineering. Students learn they can actually use their knowledge to build something very practical, which may include a high-fidelity amplifier, a radio, a memory cell, a transmitter, etc.
Prerequisite: Minimum grade of C- in ENEE303; and minimum grade of C- in ENEE307; and must have earned a minimum grade of regular (letter) C- in all required 200-level ENEE courses; and permission of ENGR-Electrical & Computer Engineering department.
Restriction: Must be in one of the following programs (Engineering: Electrical; Engineering: Computer).

ENEE419 Topics in Microelectronics (1-3 Credits)
Selected topics of current importance in microelectronics.
Prerequisite: Permission of ENGR-Electrical & Computer Engineering department; and completion of all lower-division technical courses in the EE curriculum.
Restriction: Must be in one of the following programs (Engineering: Electrical; Engineering: Computer).
Repeatable to: 99 credits if content differs.

ENEE420 Communication Systems (3 Credits)
Fourier series, Fourier transforms and linear system analysis; random signals, autocorrelation functions and power spectral densities; analog communication systems: amplitude modulation, single-sideband modulation, frequency and phase modulation, sampling theorem and pulse-amplitude modulation; digital communication systems pulse-code modulation, phase-shift keying, differential phase shift keying, frequency shift keying; performance of analog and digital communication systems in the presence of noise.
Prerequisite: Minimum grade of C- in ENEE322 or ENEE323; and minimum grade of C- in ENEE324; and completion of all lower-division technical courses in the Electrical Engineering curriculum.
Restriction: Must be in one of the following programs (Engineering: Computer; Engineering: Electrical), and permission of ENGR-Electrical & Computer Engineering department.

ENEE425 Digital Signal Processing (3 Credits)
Sampling as a modulation process; aliasing; the sampling theorem; the Z-transform and discrete-time system analysis; direct and computer-aided design of recursive and nonrecursive digital filters; the Discrete Fourier Transform (DFT) and Fast Fourier Transform (FFT); digital filtering using the FFT; analog-to-digital and digital-to analog conversion; effects of quantization and finite-word-length arithmetic.
Prerequisite: Minimum grade of C- in ENEE322 or ENEE323.
Restriction: Must be in one of the following programs (Engineering: Computer; Engineering: Electrical), and permission of ENGR-Electrical & Computer Engineering department.

ENEE426 Communication Networks (3 Credits)
The main design issues associated with computer networks, satellite systems, radio nets, and general communication networks. Application of analytical tools of queuing theory to design problems in such networks. Review of proposed architectures and protocols.
Prerequisite: ENEE324 or STAT400; and completion of all lower-division technical courses in the EE curriculum.
Restriction: Must be in Engineering: Computer or Engineering: Electrical program.
Credit Only Granted for: CMSC417 or ENEE426.

ENEE427 Communications Design Laboratory (2 Credits)
Advanced Laboratory course exploring signal processing and communication systems theoretical concepts and implementing them on actual DSP based hardware in real time.
Prerequisite: Minimum grade of C- in ENEE322 or ENEE323; and minimum grade of C- in ENEE324 or STAT400; and completion of all lower-division technical courses in the EE curriculum.
Recommended: ENEE420 and ENEE425.
Restriction: Must be in Engineering: Electrical or Engineering: Computer program; and permission of Electrical and Computing Engineering Department.
Credit Only Granted for: ENEE427 or ENEE428.
Formerly: ENEE428.

ENEE429 Topics in Communications (1-3 Credits)
Selected topics of current importance in communications.
Prerequisite: Permission of ENGR-Electrical & Computer Engineering department; and completion of all lower-division technical courses in the EE curriculum.
Restriction: Must be in one of the following programs (Engineering: Electrical; Engineering: Computer).
Repeatable to: 99 credits if content differs.

ENEE435 Quantum Information Processing (3 Credits)
Basics of linear algebra and probability theory used in quantum information processing. Quantum gates and their applications. Quantum computations and algorithms. Quantum cryptography, covering the Bennett-Brassard and Eckert key distribution protocols. Quantum error correction, examples of stabilizer codes.
Prerequisite: Minimum grade of B- in MATH240, MATH461, ENEE290, or PHYS 274; and minimum grade of C- in ENEE491 or equivalent .
Recommended: ENEE324 or STAT400.
Restriction: Must be in one of the following programs (Engineering: Electrical; Engineering: Computer); and must be in the Quantum Science and Engineering minor.
Additional Information: ECE students not in the minor should contact their ECE advisor or email eceadvise@umd.edu for assistance.

ENEE436 Foundations of Machine Learning (3 Credits)
A broad introduction to the foundations of Machine Learning (ML), as well as hands-on experience in applying ML algorithms to real-world data sets. Topics include various techniques in supervised and unsupervised learning, as well as applications to computer vision, data mining, and speech recognition.
Prerequisite: 1 course with a minimum grade of C- from (ENEE324, STAT400); and 1 course with a minimum grade of C- from (ENEE150, CMSC216); and permission of ENGR-Electrical & Computer Engineering department.
Restriction: Permission of ENGR-Electrical & Computer Engineering department. And must be in one of the following programs (Engineering: Electrical; Engineering: Computer) ; or must be in the ECE Department's Machine Learning notation program.
Credit Only Granted for: ENEE436, ENEE439M, or CMSC422.
Formerly: ENEE439M.

ENEE439 Topics in Signal Processing (1-3 Credits)
Selected topics of current importance in signal processing.
Prerequisite: Permission of ENGR-Electrical & Computer Engineering department; and completion of all lower division technical courses in the EE curriculum.
Restriction: Must be in one of the following programs (Engineering: Computer; Engineering: Electrical).
Repeatable to: 99 credits if content differs.

ENEE440 Microprocessors (3 Credits)
Microprocessor architectures, instruction sets, and applications. Bus structures, memory, I/O interfacing. Assembly language programming, LSI device configuration, and the embedding of microprocessors in systems.
Prerequisite: ENEE350; and completion of all lower division technical courses in the EE curriculum.
Restriction: Must be in one of the following programs (Engineering: Computer; Engineering: Electrical).

ENEE445 Computer Laboratory (2 Credits)
This laboratory course focuses on the hardware/software interface in computer systems. Hands-on experiments are used to teach design, construction, analysis, and measurement of both hardware and software for embedded systems. Projects emphasize using microcontrollers for control, sensing, and communication through various I/O devices.
Prerequisite: Minimum grade of C- in ENEE205 and ENEE350.
Restriction: Must be in one of the following programs (Engineering: Computer; Engineering: Electrical); and permission of ENGR-Electrical & Computer Engineering department.

ENEE446 Digital Computer Design (3 Credits)
Hardware design of digital computers. Arithmetic and logic units, adders, multipliers and dividers. Floating-point arithmetic units. Bus and register structures. Control units, both hardwired and microprogrammed. Index registers, stacks, and other addressing schemes. Interrupts, DMA and interfacing.
Prerequisite: ENEE350; and completion of all lower-division technical courses in the EE curriculum.
Restriction: Permission of ENGR-Electrical & Computer Engineering department.
Credit Only Granted for: ENEE446 or CMSC411.

ENEE447 Operating Systems (4 Credits)
The course will present the theory, design, implementation and analysis of computer operating systems. Through classroom lectures, homework, and projects, students learn the fundamentals of concurrency, process management, interprocess communication and synchronization, job scheduling algorithms, memory management, input-output devices, file systems, and protection and security in operating systems. Optional topics may include communications protocols, computer security, and real-time operating systems. The lectures will be complemented with a significant level of programming, bringing up a simple operating system from scratch, concurrently as the topics are discussed in lecture. A weekly recitation section will provide TA support and an informal laboratory atmosphere. Each student will have their own board, so development will be done largely outside the classroom at each student's pace.
Prerequisite: 1 course with a minimum grade of C- from (CMSC414, CMSC417, CMSC420, CMSC430, CMSC433, CMSC435, ENEE440, ENEE457); and permission of ENGR-Electrical & Computer Engineering department; and (ENEE350, CMSC330, and CMSC351).
Restriction: Must be in Engineering: Computer program; and permission of ENGR-Electrical & Computer Engineering department.
Credit Only Granted for: ENEE447 or CMSC412.

ENEE452 Embedded Systems (3 Credits)
Embedded systems are part of most of the modern technological systems such as Industrial machines, consumer electronics, agricultural and process industry devices, automobiles, medical equipment, cameras, household appliances, airplanes, vending machines and toys, as well as mobile devices. Embedded systems are comprised of hardware, software and firmware. Design Methodologies and platforms for real time modern embedded digital systems have been evolving over time. In order to meet the system specifications, many models, tools, and operating systems exist to automate the design space exploration phase. In this course, students will be introduced to microcontroller-based embedded system design, fundamental concepts of a Real Time Operating System (RTOS), and the design of solutions for the Internet of Things (IOT). Using hands-on experience developed through practical designs, exercises, and projects, we will discuss in detail how to analyze, implement, and synthesize these systems.
Prerequisite: Minimum grade of C- in ENEE350 and ENEE244; and minimum grade of C- in ENEE150 or CMSC216.
Restriction: Permission of the Electrical and Computer Engineering Department; and must be in one of the following programs (Engineering: Computer; Engineering: Electrical).
Credit Only Granted for: ENEE452 or ENEE459V.
Formerly: ENEE459V.

ENEE456 Cryptography (3 Credits)
The theory, application, and implementation of mathematical techniques used to secure modern communications. Topics include symmetric and public-key encryption, message integrity, hash functions, block-cipher design and analysis, number theory, and digital signatures.
Prerequisite: (CMSC106, CMSC131, or ENEE150; or equivalent programming experience); and (2 courses from (CMSC330, CMSC351, ENEE324, or ENEE382); or any one of these courses and a 400-level MATH course, or two 400-level MATH courses); and Permission of CMNS-Mathematics department or permission of instructor.
Cross-listed with: MATH456, CMSC456.
Credit Only Granted for: MATH456, CMSC456 or ENEE456.

ENEE457 Computer Systems Security (3 Credits)
Theoretical and practical aspects of computer systems security. Topics covered include symmetric/asymmetric encryption, message authentication, digital signatures, access control, as well as network security, web security and cloud security. Students acquire tools necessary for designing secure computer systems and programs and for defending against malicious threats (e.g., viruses, worms, denial of service).
Prerequisite: Minimum grade of C- in ENEE350; and permission of ENGR-Electrical & Computer Engineering department.
Restriction: Must be in one of the following programs (Engineering: Electrical; Engineering: Computer) ; and permission of ENGR-Electrical & Computer Engineering department.
Credit Only Granted for: CMSC414 or ENEE457.

ENEE459 Topics in Computer Engineering (1-3 Credits)
Selected topics of current importance in computer engineering.
Prerequisite: Permission of ENGR-Electrical & Computer Engineering department; and completion of all lower-division technical courses in the EE curriculum.
Restriction: Must be in one of the following programs (Engineering: Computer; Engineering: Electrical).
Repeatable to: 99 credits if content differs.

ENEE460 Control Systems (3 Credits)
Mathematical models for control system components. Transform and time domain methods for linear control systems. Introductory stability theory. Root locus, bode diagrams and Nyquist plots. Design specifications in the time and frequency domains. Compensation design in the time and frequency domain. Introduction to sampled data systems.
Prerequisite: ENEE322; and (ENEE290, MATH240, or MATH461); and completion of all lower-division technical courses in the EE curriculum.
Restriction: Must be in one of the following programs (Engineering: Computer; Engineering: Electrical).

ENEE461 Control Systems Laboratory (3 Credits)
Students will design, implement, and test controllers for a variety of systems. This will enhance their understanding of feedback control and familiarize them with the characteristics and limitations of real control devices. They will also complete a small project. This will entail writing a proposal, purchasing parts for their controller, building the system, testing it, and writing a final report describing what they have done.
Prerequisite: Minimum grade of C- in ENEE205; and minimum grade of C- in ENEE322 or ENEE323.
Restriction: Must be in one of the following programs (Engineering: Computer; Engineering: Electrical); and permission of ENGR-Electrical & Computer Engineering department.
Credit Only Granted for: ENEE461, ENME461, or ENME489N.

ENEE463 Digital Control Systems (3 Credits)
Introduction to techniques for the analysis and design of linear control systems and implementation of control systems using digital technology. Topics include linearization, solution of linear equations, z-transforms and Laplace transforms, design of linear controllers, optimal control, and digital implementation of control designs. Students will use MATLAB for the solution of problems and the design of control systems.
Prerequisite: Minimum grade of C- in ENEE322 or ENEE323.
Restriction: Must be in one of the following programs (Engineering: Computer; Engineering: Electrical), and permission of ENGR-Electrical & Computer Engineering department.

ENEE464 Introduction to Optimization (3 Credits)
Students will be introduced to linear, nonlinear, unconstrained, constrained optimization. Convex optimization will be highlighted. Applications will be considered, in particular in the area of machine learning. Some optimization algorithms may be discussed, time permitting.
Prerequisite: One of the following: ENEE290, MATH240, MATH341, or MATH461; and must have completed or be concurrently enrolled in ENEE324 or STAT400.
Recommended: Experience in Matlab or Python.
Restriction: Must be in the Department of Electrical and Computer Engineering; and must have permission of ENGR-Electrical & Computer Engineering department.
Credit Only Granted for: ENEE464 or ENEE469O.
Formerly: ENEE469O.

ENEE467 Robotics Project Laboratory (3 Credits)
Teaches practical skills to build, control, and deploy robotic systems. Interdisciplinary groups of students develop real-world robotic systems, with emphasis on making a real robot do what one wants it to do.
Prerequisite: Minimum grade of C- in ENAE450.
Restriction: Must be in the Robotics and Autonomous Systems minor; and permission of Department of Electrical and Computer Engineering.

ENEE469 Topics in Controls (1-3 Credits)
Selected topics of current importance in controls.
Prerequisite: Permission of ENGR-Electrical & Computer Engineering department; and completion of all lower-division technical courses in the EE curriculum.
Repeatable to: 99 credits if content differs.

ENEE473 Electrical Machines Laboratory (2 Credits)
Students will learn theory and measurement methods of passive power components, multi-phase AC power, single and three-phase transformers, single and three-phase induction machines, three-phase synchronous machines, and DC machines. Each of these topics is addressed in one or more laboratory exercises.
Prerequisite: Minimum grade of C- in ENEE205; and must have earned a minimum grade of regular (letter) C- in all required 200-level ENEE courses.
Recommended: ENEE322 or ENEE323.
Restriction: Permission of the Electrical and Computer Engineering Department.

ENEE474 Power Systems (3 Credits)
Interconnected power systems, transmission lines, load flow studies, unit commitment and economic dispatch. Three phase networks, machine models. Symmetrical components, fault analysis and unbalanced operation. Power system transients, stability and numerical methods in power system analysis.
Prerequisite: Minimum grade of C- in ENEE322 or ENEE323.
Restriction: Must be in one of the following programs (Engineering: Computer; Engineering: Electrical), and permission of ENGR-Electrical & Computer Engineering department.

ENEE475 Power Electronics (3 Credits)
This course is suitable for undergraduate and graduate students who want to learn the basic principles of power electronics and its applications. Special emphasis is placed on the interdisciplinary nature of power electronics. Strong and intimate connections between power electronics and circuit theory, electronic circuits, semiconductor devices, electric power, magnetic, motor drives and control are stressed.
Prerequisite: Minimum grade of C- in ENEE303 or ENEE304.
Restriction: Must be in one of the following programs (Engineering: Electrical; Engineering: Computer); and permission of ENGR-Electrical & Computer Engineering department.

ENEE476 Renewable Energy (3 Credits)
Solar Energy Conversion Systems: History of Photovoltaic (PV) Systems, PV Cell, Module and Array Models and Equivalent Circuits, Characteristic Resistance, Fill Factor, Effects of Parasitic Resistances, Mismatch Effects, Shading, Bypass Diodes, Sun Tracking Systems, Maximum Power Point Tracking (MPPT) Techniques, Isolated and Non-isolated Switch-mode DC/DC for PV Systems, Inverter Design and Control, Sizing the PV Panel and Battery Pack in PV Applications. Wind Energy Conversion Systems: Introduction to Wind Energy Harvesting, Horizontal and Vertical Wind Systems, Fundamentals of Wind Energy Harvesting Systems, Variable Speed and Fixed Speed Wind Energy Conversion Systems (WECS), Wind Turbines and Different Electrical Machines in Wind Applications, Induction Machine and Dynamic Model of Induction Machines, Synchronous Generators and Dynamic Model of SG, Control of Wind Energy Conversion Systems.
Prerequisite: Minimum grade of C- in ENEE303 or ENEE304.
Restriction: Must be in one of the following programs (Engineering: Computer; Engineering: Electrical), and permission of ENGR-Electrical & Computer Engineering department.

ENEE484 Optoelectronic Devices (3 Credits)
Explores the fundamental physics of optoelectronic devices including lasers, solar cells, LEDs, and photodetectors. We aim at an understanding of the fundamental principles on device physics, material considerations, and significant components of optoelectronic devices. State-of-the-art device configurations and material choices in industry and academia will be discussed.
Recommended: A background in semiconductors and P-N junctions.
Restriction: Permission of the Electrical and Computer Engineering Department.
Credit Only Granted for: ENEE484 or ENEE489I.
Formerly: ENEE489I.

ENEE486 Optoelectronics Lab (2 Credits)
Hands-on experience in performing measurements in optics and electro-optics. Basics of optics, light detectors, Fourier optics, gratings and spectrometers, pulsed dye lasers, fiber optics, electro-optics, and acousto-optics.
Prerequisite: Minimum grade of C- in ENEE205; or minimum grade of C- in ENEE206. And minimum grade of C- in PHYS271 and PHYS270; and must have earned a minimum grade of regular (letter) C- in all required 200-level ENEE courses; and permission of ENGR-Electrical & Computer Engineering department.
Restriction: Must be in one of the following programs (Engineering: Computer; Engineering: Electrical).

ENEE488 Independent Study in Electrical and Computer Engineering (1-3 Credits)
The purpose is to provide students with an opportunity for independent study projects on advanced electrical and computer engineering topics. These projects typically involve academic investigations of technical themes that are not addressed in the established elective and special topics courses taught by the department on a regular basis. Study plans are tailored to students educational goals but are approved and supervised by faculty.
Prerequisite: Must have completed and earned a minimum grade of regular (letter) C- in all lower-division EE or CP tech electives; and permission of ENGR-Electrical & Computer Engineering department.
Restriction: Must be in one of the following programs (Engineering: Computer; Engineering: Electrical).
Repeatable to: 9 credits if content differs.
Additional Information: A total of 5 credits combined of ENEE488 and ENEE499 can count towards a degree in electrical and computer engineering.

ENEE489 Topics in Electrophysics (1-3 Credits)
Selected topics of current importance in electrophysics.
Prerequisite: Permission of ENGR-Electrical & Computer Engineering department; and completion of all lower-division technical courses in the EE curriculum.
Restriction: Must be in one of the following programs (Engineering: Computer; Engineering: Electrical).
Repeatable to: 99 credits if content differs.

ENEE490 Physical Principles of Wireless Communications (3 Credits)
This course is intended to give students an overall understanding of the physical phenomena involved in wireless communications and to allow them to make first-cut designs. Major topics covered include antennas, antenna arrays, radiowave scattering and propagation, noise sources in communications systems, cell phone systems and satcom.
Prerequisite: ENEE381.
Restriction: Must be in one of the following programs (Engineering: Computer; Engineering: Electrical).

ENEE491 Quantum Phenomena in Electrical Engineering (3 Credits)
Wave phenomena, wave-particle duality and laws of quantum mechanics. States, observables, operators and measurement, as applied to simple quantum circuits, information transmission and quantum key distribution. Also, covered: Schrodinger's equation, bound states, tunneling, scattering, periodic potentials, superconductivity and Josephson junctions.
Prerequisite: Minimum grade of C- in PHYS270, ENEE205 and (ENEE290 or MATH461).
Restriction: Permission of Electrical and Computer Engineering Department.
Credit Only Granted for: ENEE491 or ENEE489Q.
Formerly: ENEE489Q.

ENEE492 Introduction to Quantum Technology (3 Credits)
Investigates the basic concepts/building blocks of quantum computers, quantum key distribution, quantum networks, and quantum sensors. Examines what is needed to form a working qubit and different hardware platforms that implement them (for example, trapped ions, superconducting microwave circuits, color centers, and neutral atoms.) Conceptual and computational familiarity with complex numbers, vector spaces, bases, matrices, eigenvectors, and eigenvalues will be assumed, as well as quantum states/wave functions, and quantum measurement. Familiarity with spin-1/2 systems, and Pauli matrices is highly recommended.
Prerequisite: MATH141 and MATH240 or equivalent; and one of the following: PHYS360, PHYS401, PHYS457, CMSC457, or ENEE491; or permission of instructor.
Cross-listed with: PHYS467.
Credit Only Granted for: PHYS467 or ENEE492.

ENEE493 Quantum Hardware Laboratory (3 Credits)
The purpose of this lab course is to provide hands on experience for the students in working with experimental hardware and techniques which are used in research in the field of quantum computing, quantum communications and quantum sensors.
Prerequisite: Minimum grade of C- in one of the following courses: ENEE491, ENMA434, PHYS360, or PHYS401.
Restriction: Must be in the Quantum Science and Engineering minor; or have permission from the ECE department; and permission of Department of Electrical and Computer Engineering.

ENEE496 Lasers and Electro-optic Devices (3 Credits)
Modern physical optics: Gaussian beams, optical resonators, optical waveguides; theory of laser oscillation, rate equations; common laser systems. Selected modern optoelectronic devices like detectors and modulators. Role of lasers and optoelectronics in modern technology.
Prerequisite: ENEE381; and completion of all lower-division technical courses in the EE curriculum.
Restriction: Must be in one of the following programs (Engineering: Computer; Engineering: Electrical).

ENEE498 Topics in Electrical Engineering (1-3 Credits)
Selected topics of current importance in electrical engineering.
Prerequisite: Permission of ENGR-Electrical & Computer Engineering department; and completion of all lower-division technical courses in the EE curriculum.
Restriction: Must be in Engineering: Electrical program.
Repeatable to: 12 credits if content differs.

ENEE499 Senior Projects in Electrical and Computer Engineering (1-6 Credits)
The purpose is to provide students with an opportunity to engage in independent research projects on advanced electrical and computer engineering topics. Projects are selected by students and supervised by faculty and other qualified mentors. While students may be required to acquire new skills or information in the course of completing a 499 project, the focus is to conduct an independent investigation of a technical theme by the student. The project may be used to satisfy the advanced lab requirement if it is approved as a primarily experimental research project. In that case, the student will enroll in ENEE499L.
Prerequisite: Completion of all lower-division technical courses in the electrical or computer engineering curriculum.
Restriction: Permission of ENGR-Electrical & Computer Engineering department.
Repeatable to: 6 credits if content differs.
Additional Information: For students in the ECE Honors Program, a total of 6 credits combined of ENEE488 and ENEE499/499L can count toward a degree in electrical or computer engineering. For non-honors ECE students, a total of 5 credits combined of ENEE488 and ENEE499/499L can count toward a degree in electrical or computer engineering.

ENES - Engineering Science

ENES100 Introduction to Engineering Design (3 Credits)
Students work as teams to design and build a product using computer software for word-processing, spreadsheet, CAD, and communication skills.
Prerequisite: Must have math eligibility for MATH140 or higher.

ENES102 Mechanics I (3 Credits)
The equilibrium of stationary bodies under the influence of various kinds of forces. Forces, moments, couples, equilibrium, trusses, frames and machines, centroids, moment of inertia, beams, friction, stress/strain, material properties. Vector and scalar methods are used to solve problems.
Prerequisite: Minimum grade of C- or better in MATH140.
Restriction: Must be in a major in ENGR-A. James Clark School of Engineering.

ENES106 Achieving Success in Mathematics (3 Credits)
An exploration of the skills and habits needed to successfully complete introductory mathematics courses.
Restriction: Permission of ENGR-A. James Clark School of Engineering.

ENES107 Achieving College Excellence (1-3 Credits)
An exploration of the skills and habits needed to successfully complete the introductory chemistry course for engineering students. Course will also include strategies for a successful first year experience.
Restriction: Permission of ENGR-A. James Clark School of Engineering.

ENES108 Achieving College Success: First Year Transition (1 Credit)
An exploration of the skills and habits needed to successfully complete the first year of study for Science, Technology, Engineering, and Mathematics (STEM) majors. This course is an extension of the college success seminars taught during the Summer Bridge Program.
Restriction: Permission of ENGR-A. James Clark School of Engineering.
Repeatable to: 2 credits if content differs.

ENES113 Virtus Living and Learning Community Seminar I (1 Credit)
The seminar focuses on personal and professional development related to the field of engineering with a strong emphasis on clarifying career goals and decisions. Additional topics include an introduction to basic tools, undergraduate research opportunities, and campus and engineering resources.
Restriction: Must be in first year Virtus program.

ENES114 Virtus Seminar II (1 Credit)
Focus on personal and professional development with engineering with a strong emphasis on career development. Learn to employ strategies and skills for academic and professional success.
Prerequisite: ENES113.
Restriction: Students must be participants in the Virtus Living and Learning Community.

ENES115 FLEXUS Living and Learning Community Seminar I (1 Credit)
The seminar focuses on personal and professional development related to the field of engineering with a strong emphasis on clarifying career goals and decisions. Additional topics include an introduction to campus and engineering resources, basic tools, and undergraduate research opportunities. Students will discuss issues of concern through a variety of book readings, self-reflections, and panel discussions with practicing women engineers.
Restriction: Must be a first year FLEXUS Participant.

ENES116 FLEXUS Living and Learning Community Seminar II (1 Credit)
The seminar focuses on personal and professional development by enhancing technical ability, understanding educational options through minors and student projects in engineering, identifying and employing strategies and skills for academic and professional success, and developing career commitment through networking and mentoring. Students develop professional portfolios in preparation for a future internship or job.
Prerequisite: ENES115.
Restriction: Must be in the Flexus Living-Learning Program.

ENES138 Exploring Engineering Design Through Dialogue (1 Credit)
Through deliberate reflections on past and current successes and failures in engineering design, you will develop skills for engaging in processes and practices that can transform your collaborations on teams and approach to engineering. This course engages students in facilitated dialogue in order to strengthen the engineering design process and outcomes.
Restriction: Must be a student in the A. James Clark School of Engineering or in the Global Engineering Leadership minor.
Credit Only Granted for: ENES338K, CHSE338K, or ENES138.
Formerly: ENES338K.

ENES140 Discovering New Ventures (3 Credits)
Students explore dynamic company startup topics by working in teams to design a new venture. This multi-disciplinary course helps students to learn the basic business, strategy, and leadership skills needed to launch new ventures. Topics include learning how to assess the feasibility of a startup venture, as well as how to apply best practices for planning, launching, and managing new companies. Students discuss a wide range of issues of importance and concern to entrepreneurs and learn to recognize opportunities, assess the skills and talents of successful entrepreneurs, and learn models that help them navigate uncertainty.
Additional Information: This course may count as an elective for a student at the University of Maryland, depending on the student's specific degree program. It cannot be counted towards the requirements for the Smith School of Business Entrepreneurship Fellow Program.

ENES181 Engineering & The Grand Challenges (1 Credit)
Introduction to the various fields of engineering and the necessary context for students to fully engage in selected National Academy of Engineering's Grand Challenges such as economical solar energy, carbon sequestration, access to clean water, engineering better medicines, restoring urban infrastructure and personalized learning. The lectures and activities will provide an introduction to the engineering disciplines, NAE Grand Challenges, STEM cultures, and research.
Restriction: Must be in a major in ENGR-A. James Clark School of Engineering; and must be a new freshman or transfer student.

ENES192 Engineering For Us All (3 Credits)
Students are challenged to uncover hidden valuable connections among a variety of disciplines, while creatively seeking and solving problems as a team. Students learn and practice skills for how groups function and identify innovation while addressing the tensions between our inherent drives to seek and solve, to share, and to sell.
Prerequisite: MATH107.
Additional Information: Recommended for non-engineering majors.

ENES193 Engineering Design Principles and Practices (1 Credit)
Introduces students to engineering design practices by challenging them to modify an existing product or design to meet additional specifications and constraints. Using a combination of computational modeling, CAD tools, and rapid prototyping techniques, students will iteratively develop, test, and refine their designs. Teams will justify design choices based on data, performance criteria, and real-world considerations. By the end of the course, students will have built and tested a functional prototype, critically evaluated both their design product and design process, and recommended areas for future improvements to both product and process.
Prerequisite: Minimum grade of C- in ENES192.
Credit Only Granted for: ENES100 or (ENES192 and ENES193).

ENES197 The Fault in Our Data: What Counts and Who's Counting (3 Credits)
Quantitative data and analysis are key to understanding the shape of the world. In this course, we will use the tools of computational analysis to load, interrogate, visualize, and model datasets from dozens of data points to hundreds of thousands. We'll look at how computational methods can tell us when a movie is sexist, how wealth inequality can form, and how rumors spread like diseases. Then, you will find datasets of interest, write code to make sense of them, and share your findings with the world. No prior programming experience is required.
Prerequisite: MATH113 or equivalent.
Recommended: MATH115.

ENES200 Technology and Consequences: Engineering, Ethics and Humanity (3 Credits)
What makes a technology socially responsible? At UMD, the Fearless Ideas campaign asks us to aim our enthusiasm for technology at big real problems. At the same time, we are coming to appreciate the increasingly complex nature of technological systems as they become integrated into all forms of infrastructure, we realize they may be unpredictable, interdependent on social and biological systems, and have unintended consequences. In this midst of this complexity, people make decisions with far reaching impacts. How then do we follow our passion for technology and innovation but also stay skeptical in a way that allows us to consider the potential and shortcomings of technology? Designed for both engineering and non-engineering students wishing to explore and assess the impact of engineering technology on society and the role of society in generating that technology.
Credit Only Granted for: ENEE200 or ENES200.

ENES210 Entrepreneurial Opportunity Analysis and Decision-Making in 21st Century Technology Ventures (3 Credits)
This multi-disciplinary course helps students learn the principles of entrepreneurial opportunity analysis and decision-making in an increasingly dynamic and technically-inclined society. Emphasis is placed on how aspiring technology entrepreneurs can develop their entrepreneurial perspectives to develop winning entrepreneurial plans for their future ventures.
Credit Only Granted for: ENES210 or ENES461.

ENES213 Virtus Living and Learning Community Seminar III (1 Credit)
The seminar focuses on personal, academic and professional success by cultivating leadership skills, developing academic and technical ability and encouraging self awareness, identifying and employing strategies for academic and professional success, further enhancing career development through networking and mentoring and developing awareness of diversity issues.
Prerequisite: ENES113 and ENES114.
Restriction: Must be a participant in the second year of the Virtus living-learning program.

ENES214 Virtus Seminar IV (1 Credit)
Students continue to develop their leadership and mentoring skills, participate in networking opportunities and explore their interest in special engineering topics.
Prerequisite: Students must have completed ENES213.
Restriction: Students must be participants in the Virtus Living and Learning Community.

ENES215 FLEXUS Living and Learning Community Seminar III (1 Credit)
The seminar focuses on personal, academic and professional success by cultivating leadership skills, developing self-confidence and self-efficacy in academic and technical ability and encouraging self awareness, identifying and employing strategies for academic and professional success, further enhancing career development through networking, mentoring and role modeling, and developing awareness of diversity issues, specifically gender diversity.
Prerequisite: ENES115 and ENES116.
Restriction: Must be a second year FLEXUS participant.

ENES216 FLEXUS Living and Learning Community Seminar IV (1 Credit)
The seminar focuses on gender diversity and its cross-sections with culture. Students continue to enhance their leadership and mentoring skills, participate in networking opportunities with women in leadership roles and careers in engineering, and engage in opportunities for outreach and service-learning. Students will also complete a culminating semester project.
Prerequisite: ENES115, ENES116, and ENES215.
Restriction: Restricted to second year FLEXUS participants.

ENES220 Mechanics II (3 Credits)
Stress and deformation of solids-rods, beams, shafts, columns, tanks, and other structural, machine and vehicle members. Topics include stress transformation using Mohr's circle; shear and moment diagrams; derivation of elastic curves; and Euler's buckling formula. Design problems related to this material are given in lab.
Prerequisite: Minimum grade of C- in ENES102; and (MATH141 and PHYS161).
Restriction: Must be in a major in ENGR-A. James Clark School of Engineering; and must not be in Engineering: Electrical program.

ENES221 Dynamics (3 Credits)
Systems of heavy particles and rigid bodies at rest and in motion. Force-acceleration, work-energy and impulse-momentum relationships. Motion of one body relative to another in a plane and in space.
Prerequisite: Minimum grade of C- in ENES102; and (MATH141 and PHYS161).
Restriction: Must be in a major in ENGR-A. James Clark School of Engineering.

ENES232 Thermodynamics (3 Credits)
Introduction to thermodynamics. Thermodynamic properties of matter. First and second laws of thermodynamics, cycles, reactions, and mixtures.
Prerequisite: Minimum grade of C- in PHYS161, MATH141, CHEM135, and (ENES102 or ENAE222).
Restriction: Must be in a major in ENGR-A. James Clark School of Engineering.
Credit Only Granted for: BIOE232, CHBE301, or ENES232.

ENES240 Ethical, Policy and Social Implications of Science and Technology (3 Credits)
Asks students to think about how society should manage complexity, transformation, and uncertainty with an eye on developing a broader sense of ethics and social responsibility. Introduces analytical frameworks, concepts, and data collection techniques that interdisciplinary scholars use to map relationships among science, technology and society and generate important questions about the future of society.
Cross-listed with: PLCY240.
Credit Only Granted for: ENES240 or PLCY240.

ENES250 Why Do Things Fail? (3 Credits)
Why did the Silver Bridge between Ohio and West Virginia collapse on Christmas Eve, 1967? What caused the top of an Aloha Airlines flight to rupture, creating a convertible airplane? How do these kinds of massive structural damage occur, and how might we prevent them? This course will introduce students to topics of stress and strain and their importance in determining the safety and reliability of engineering structures. Some of the major structural failures worldwide will be identified and researched as to the circumstances leading up to the failures. Reasons for failures will be investigated and are expected to include engineering, social, political, ethical, and economic explanations. Other possible failures to be researched and analyzed would be the collapse of a walkway in Kansas City, the failure of the Tacoma Narrows Bridge in Washington, the collapse of a bridge on Interstate 95 in Connecticut, and the collapse of the Twin Towers in New York after 911.
Credit Only Granted for: HONR288O or ENES250.
Formerly: HONR288O.

ENES256 Partnering With Artificial Intelligences To Reimagine Our Future (3 Credits)
How can we effectively and responsibly partner with artificial intelligences to tackle previously unthinkable problems--and reimagine what's possible for our future? In this course we will explore what it means to think, create, and collaborate in a world where artificial intelligences are not just tools, but teammates. As AIs become increasingly capable partners in thinking, designing, and decision-making, new futures become imaginable--and attainable. We'll examine key cognitive processes such as reasoning, memory, perception, and creativity in both humans and machines. Students will gain hands-on experience working with generative AI tools and autonomous agents on real-world challenges. Along the way, we'll critically assess the risks, ethics, and design choices involved in these hybrid systems--and imagine how human-AI partnerships might shape the future of knowledge, innovation, and society.

ENES259 Study Abroad Special Topics in Engineering II (1-6 Credits)
Special topics course in engineering science taken as part of an approved study abroad program.
Repeatable to: 6 credits if content differs.

ENES260 AI4ALL: Introduction to Machine Learning for All Engineers (3 Credits)
This introductory course covers a wide range of topics, from the fundamentals of linear algebra and programming to advanced topics such as backpropagation in neural networks and hardware considerations for Large Language Models. This course will explore how professionals use Machine Learning (ML) to solve real-world engineering problems and even implement models in a team-based project. This course also delves into unsupervised algorithms for dimensionality reduction, defensive strategies against adversarial attacks on ML, ethical considerations of the open internet, and copyright.
Prerequisite: Minimum grade of C- in MATH140.
Recommended: Some programming experience is recommended, especially in Python.
Restriction: Permission of Department (Keystone).

ENES269 Topics in Grand Challenges for Engineering in a Global Context (3 Credits)
Special topics course that explores the grand engineering challenges facing the world from a technical, cultural, political, and economic perspective, as well as solutions developed through innovation and technology. Topics can include energy, environment, urban infrastructure, health, safety and security, and engineering the tools of discovery.
Repeatable to: 6 credits if content differs.
Additional Information: Course includes a study abroad component. No engineering background is required.

ENES275 How Do You Navigate Leadership in Times of Crisis? (3 Credits)
Students take part in immersive opportunities to learn from industry professionals about crisis prevention and response. The course introduces students to the study and practice of leadership with promising practices in disaster preparedness and data informed decision-making. Global communities need those who can lead during times of crisis and understand when and how to use data to inform decisions in times of crisis. This course will examine how leadership has been enacted to help local, national, and global communities navigate through pandemics, disasters, and other humanitarian crises. Students will develop capacities for informed leadership in times of crisis and develop an understanding for applying these skills in a variety of settings.
Credit Only Granted for: ENES275 or ENES475.

ENES300 Unveiling Hidden Barriers: How the World is Engineered for Some, and Not for Others (3 Credits)
By unveiling hidden barriers in technical design, students will use a multidisciplinary approach to envision and propose more inclusive, equitable, and community-responsive design. Through a systems-thinking lens and case studies from both the U.S. and global contexts, students will analyze how historical, political, and social forces shape design processes, determine access and benefit, and often reproduce inequities. Students will engage with case studies and real world application within STEM education; artificial intelligence; transportation infrastructure; safety & compliance; urban design; data, information technology & cybersecurity; and agriculture & food sciences.
Restriction: Must be in the A. James Clark School of Engineering; or must have permission from the A. James Clark School of Engineering.

ENES304 RISE Seminar (1 Credit)
This is the first semester of a two semester sequence taken by RISE students in their first semester in the program. T he purpose of ENES 304 is for RISE students to learn about leadership, acquire leadership skills, and understand how to integrate leadership theories and concepts in engineering practice. There will be a mix of formal lectures by course faculty and lectures by distinguished speakers who can provide their own experience of what leadership means and how it is acquired. Students will explore their own leadership philosophy and leadership capacities in the context of group practice. Students will make meaning of general leadership theories and concepts and understand how to apply them to engineering industry. Students will also gain understanding of leadership through the stories shared by distinguished speakers with industrial, governmental and academic experience.
Restriction: Must be in the Engineering RISE Leadership Program; and permission of ENGR-A. James Clark School of Engineering.

ENES305 RISE Leadership Seminar (1 Credit)
This is the second semester of a two semester sequence taken by RISE students in their final semester in the program. The purpose of ENES 305 is for RISE students to learn about leadership, acquire leadership skills, and understand how to integrate leadership theories and concepts in engineering practice. There will be a mix of formal lectures by course faculty and lectures by distinguished speakers who can provide their own experience of what leadership means and how it is acquired. Students will explore their own leadership philosophy and leadership capacities in the context of group practice. Students will make meaning of general leadership theories and concepts and understand how to apply them to engineering industry. Students will also gain understanding of leadership through the stories shared by distinguished speakers with industrial, governmental and academic experience.
Prerequisite: Permission of ENGR-A. James Clark School of Engineering; and ENES304.

ENES316 Global Leadership in Engineering, Business, & Technology (3 Credits)
An introduction to global leadership research, theories, and practice with an emphasis on applied dimensions of global leadership in the engineering, business, and technology sectors. This course prepares students to further their knowledge and capacities for global leadership to be successful in industry.
Restriction: Must be in a major in ENGR-A. James Clark School of Engineering; or permission of instructor.
Additional Information: Students will be required to participate in off-campus industry visits outside of the formal class meeting time.

ENES317 Introduction to Leadership in Engineering, Science, and Technology (3 Credits)
Develop a comprehensive overview and introduction to leadership and organizational development. Students will reflect on their own leadership experiences, develop a strong foundational knowledge of leadership theory, and advance their capacities in effectively leading teams. Students will connect leadership theory to practice by engaging in case study analysis and critique leadership practices enacted within engineering and technology settings. Students will complete self-assessments to better understand their own leadership strengths and refine their approaches to leadership by incorporating theories covered in this course.
Restriction: Must be in the Minor in Global Engineering Leadership(#EN09).
Additional Information: Students not meeting restriction requirements should add themselves to the course holdfile. Restrictions DO NOT apply to winter and summer terms.

ENES332 Thermodynamics and the Technologies that Transform Civilization (4 Credits)
Explores the foundations of classical thermodynamics, including the thermodynamic properties of matter and the first and second laws as applied to processes and cycles. Students examine the historical evolution of thermodynamics from early steam engine to modern energy systems. Students explore both the technological progress enabled by thermodynamics and the broader cultural, societal, and environmental consequences of technological innovations.
Prerequisite: PHYS161, MATH141, CHEM135, and ENES102; or permission of Keystone program.
Restriction: Must be in a major in ENGR-A. James Clark School of Engineering.
Credit Only Granted for: BIOE232, CHBE301, or ENES232.
Additional Information: This is an approved Education Abroad course.

ENES338 Navigating Difference through Intergroup Dialogue (1 Credit)
The goal of intergroup dialogue is for students to develop comfort with, and skill for, discourse on controversial, difficult, and divisive topics in an effort to foster positive, meaningful, and sustained cross-group relationships. Whereas in debate, students learn to listen to gain advantage, in intergroup dialogue, students learn to listen to gain understanding. In so doing, students develop increased capacity for interaction across difference, heightened intergroup awareness and sensitivity, and greater commitment to community engagement.
Prerequisite: Completion of on-line enrollment form.
Cross-listed with: WEID139.
Repeatable to: 6 credits.
Credit Only Granted for: CHSE338, EDHI338, ENES338 or WEID139.
Formerly: CHSE338.

ENES340 Engineering and Social Justice (3 Credits)
Students will explore the relationships between engineering and social justice through personal reflection and historical and contemporary case studies. Students will explore their own social locations, privileges, alliances, and resistances to social justice through critical engagement of interdisciplinary readings that challenge engineering mindsets and ideologies. Students will work to understand what constitutes social justice in different areas of social life and the role that engineers, and engineering might play. Students will gain an understanding of why and how engineering has been aligned and divergent from social justice issues and causes.
Prerequisite: ENEE200.

ENES359T Education, Technology and Society: Ecuador in Context (3 Credits)
Set in the UNESCO World Heritage site of Cuenca, Ecuador, students in this short-term study abroad course use theory from Science and Technology Studies (STS) to explore, discuss and critique the design, development and implementation of technology-based social programs in Ecuador. The program looks at education and technology throughout multiple lenses and contexts. Collaboration with the University of Cuenca, participating students have the opportunity for both university and field-based research and practice. UMD students work alongside students and faculty from the leaders and practitioners from UCuenca, government agencies, nongovernmental organizations, small business and local communities.
Recommended: 1 course from (ENES240, ENES200, or ENEE200).
Cross-listed with: CPSS370, LACS370.
Restriction: Minimum cumulative GPA of 2.5.
Credit Only Granted for: ENES259T, ENES359T, CPSP279T, LASC269T, CPSS370, or LACS370.
Formerly: ENES259T.

ENES388 Engineering Honors Seminar (1 Credit)

ENES389 Selected Topics (3 Credits)
Repeatable to: 6 credits if content differs.

ENES390 Designing Innovative Systems (3 Credits)
The QUEST systems thinking course challenges students to analyze how processes interact in larger systems. Students will learn how to use process improvement tools and a systems thinking approach to solve problems and design innovative solutions. By drawing upon their multidisciplinary backgrounds, students will be able to understand and reframe problems from multiple perspectives to uncover new solutions.
Prerequisite: ENES190, BMGT190, ENED290 or BMGT290.
Cross-listed with: ENED390.
Restriction: Must be in the QUEST program.
Credit Only Granted for: BMGT390, ENES390 or ENED390.
Formerly: ENES390.

ENES401 Entrepreneurial Design Realization (3 Credits)
The vision for this course, and an aspect that makes it unique, is to expose students to the opportunities and challenges of bringing a product design to reality (entrepreneurship). The emphasis is on environmentally and socially sustainable projects. The end-product of this course will be full-scale implementations or complete design "packages" that can be taken to potential stakeholders.
Cross-listed with: ENME401.
Restriction: Must have senior standing and permission of instructor.
Credit Only Granted for: ENME401, ENME489B or ENES401.
Formerly: ENME489B.

ENES424 Engineering Leadership Capstone: Inclusive Leadership in Addressing Organizational & Societal Challenges (3 Credits)
The Minor in Global Engineering Leadership is designed to bring together one's understanding of leadership, organizations, culture, and global studies and apply this synthesized learning to a capstone project. The project will provide real-world application of global leadership principles to address an organizational or societal need. Students will utilize an inclusive leadership and global mindset to propose a big idea which brings about a positive organizational or societal change.
Prerequisite: ENES472 and ENES317.
Restriction: Must be in the Global Engineering Leadership minor (#EN09).

ENES428 Engineering Research for Exchange Students (3-12 Credits)
Directed research within the Clark School of Engineering for international exchange students.
Restriction: Available only to visiting exchange students taking part in an Engineering exchange program.
Repeatable to: 24 credits.

ENES434 Creating Historic Woodwinds (3 Credits)
Students will learn the art of woodworking and blend techniques of modern and historic instrument-making methods. Using wood lathes, metalworking tools, 3d scanners and selective laser sintering 3d printers. Student teams will first train to acquire the skills needed to use fabrication equipment. Each mixed team will then share their individual discipline's skills to help contribute to the creation of a completed musical instrument. Along the way, we'll explore the historical and cultural context of instrument making and the musical period.
Cross-listed with: MUSC434.
Restriction: Permission of the School of Music.
Credit Only Granted for: ENES434 or MUSC434.

ENES440 Science, Technology, Ethics, and Policy: Minor Program Capstone (3 Credits)
Capstone research seminar for students in the Science, Technology, Ethics, and Policy Minor program.
Prerequisite: Students must receive a B- or better in ENES240 and take 2 courses from the STEP minor elective list.
Restriction: Must be in the Science, Technology, Ethics, and Policy minor.
Additional Information: This is the culminating course the STEP minor program.

ENES442 Creating Historic Woodwinds (3 Credits)
In this class, students will learn the art of woodworking and blend techniques of modern and historic instrument-making methods. Using wood lathes, metalworking tools, 3d scanners and selective laser sintering 3d printers. Student teams will first train to acquire the skills needed to use fabrication equipment. Each mixed team will then share their individual discipline's skills to help contribute to the creation of a completed musical instrument. Along the way, we'll explore the historical and cultural context of instrument making and the musical period.
Cross-listed with: MUSC442.
Credit Only Granted for: MUSC442 or ENES442.

ENES458 Topics in International Engineering (1-4 Credits)
A variety of topics related to engineering in a global context are discussed including cultural aspects, cross-cultural communication, international standards and law, and engineering and technology issues, business behavior, attitudes and values of selected countries and regions.
Prerequisite: ENES100.
Repeatable to: 12 credits if content differs.

ENES459 Study Abroad Special Topics in Engineering IV (1-6 Credits)
Special topics course in engineering science taken as part of an approved study abroad program.
Repeatable to: 15 credits if content differs.

ENES460 Fundamentals of Technology Start-Up Ventures (3 Credits)
Fundamental aspects of creating, organizing, funding, managing, and growing a technology startup venture. This multidisciplinary course will draw on management, business, legal, financial, as well as technical, concepts. Students form teams and develop a business plan for a technology company, based on each team's own business idea and then present the plan to a panel of outside experts.
Restriction: Permission of ENGR-Maryland Technology Enterprise Institute.
Credit Only Granted for: ENES460, BMGT461, SMLP470 or HLMN470.
Additional Information: Course may not be used to fulfill any BMGT major or minor program requirement.

ENES461 Advanced Entrepreneurial Opportunity Analysis in Technology Ventures (3 Credits)
Explores the factors that influence entrepreneurial opportunity analysis in technology-based ventures. Uses a cognitive theoretical framework to examine the integration of motivation, emotions and information processing modes to make complex entrepreneurial decisions in technology venture environments.
Credit Only Granted for: ENES210 or ENES461.

ENES462 Marketing High-Technology Products and Innovations (3 Credits)
Examines the opportunities and challenges of marketing high-technology products in turbulent environments requiring rapid decision making with incomplete information. Explores how innovations are introduced at frequent intervals, research-and-development spending is vital, and there are high mortality rates for both products and businesses.
Restriction: Permission of ENGR-Maryland Technology Enterprise Institute.
Additional Information: Course may not be used to fulfill any BMGT major or minor program requirement.

ENES463 Strategies for Managing Innovation (3 Credits)
Emphasizes how the technology entrepreneur can use strategic management of innovation and technology to enhance firm performance. Examines the process of technological change, the ways that firms come up with innovations, the strategies that firms use to benefit from innovation, and the process of formulating technology strategy. Provides frameworks for analyzing key aspects of these industries and teaches students how to apply these frameworks.
Restriction: Permission of ENGR-Maryland Technology Enterprise Institute.
Credit Only Granted for: ENES463, BMGT467, SMLP473 or HLMN472.
Additional Information: Course may not be used to fulfill any BMGT major or minor program requirement.

ENES464 International Entrepreneurship and Innovation (3 Credits)
Focuses on the need for every entrepreneur and innovator to understand the global market in today's hypercompetitive world, and to appreciate how to compete effectively in domestic markets by managing international competitors, suppliers, and influences. Explore how the distinction between foreign and domestic markets is becoming less pronounced. Develop skills to identify and manage opportunities on a global basis.
Restriction: Permission of ENGR-Maryland Technology Enterprise Institute.
Additional Information: Course may not be used to fulfill any BMGT major or minor program requirement.

ENES466 Leading and Financing the Technology Venture (3 Credits)
Focuses on the challenges of leading and financing new technology ventures. Leadership topics include team selection and formation, aligning rewards with relative contributions of team members, and how early decisions can enable or prevent founders from achieving results that align with their individual motivations for becoming an entrepreneur. Essential tools and methods for building a strong financial foundation for a new technology venture are examined. Includes important accounting principles as well as methods for keeping financial control of the technology venture. Insights are shared on navigating the multitude of financial barriers that may block your entrepreneurial success, as well as how to grow the technology venture from concept through launch.
Restriction: Permission of ENGR-Maryland Technology Enterprise Institute.
Credit Only Granted for: ENES466, BMGT365, SMLP471 or HLMN471.
Additional Information: Course may not be used to fulfill any BMGT major or minor program requirement.

ENES467 Engineering for Social Change (3 Credits)
Critical analysis of issues at the intersection of engineering, philanthropy and social change. How engineering design, products and processes have created social change in the past and will do so in the future through both intended and unintended consequences. Topics covered include energy, sustainability and climate change, autonomy, the digital future, low cost engineering, manufacturing, philanthropy, ethics and the impact of electronics on society, among others. Faculty and external experts will engage with students on these topics. Students will broadly engage with organizations involved in using technology for positive social impact.
Cross-listed with: ENME467.
Restriction: Junior standing or higher.
Credit Only Granted for: ENES467 or ENME467.
Additional Information: Students in the Mechanical Engineering (ENME) major should register for ENME467, all other majors should register under ENES467.

ENES471 Legal Aspects of Entrepreneurship (3 Credits)
Explores critical legal and business issues entrepreneurs face as they build and launch a new venture. Examines real world scenarios, and addresses the legal issues at all of the important junctures along the path to success. Significant attention placed on new venture formation, intellectual property management, and financing arrangements.
Restriction: Must be in the Minor in Technology Entrepreneurship & Corporate Innovation (#EN06).
Additional Information: Course may not be used to fulfill any BMGT major or minor program requirement.

ENES472 Leading Global Teams and Engaging Across Cultures in Business, Engineering, and Technology (3 Credits)
Develop global leadership capacities and an understanding of the cultural aspects pertaining to industry and international business. In a globalized world, the ability to work, lead and communicate in culturally diverse settings has become a core component to leadership. Through real-world examples, research, and simulations, students will increase their self-awareness and understanding of culture and how culture influences attitudes, behaviors, and practices at the individual, organizational, or societal levels. Students will develop the skills necessary to navigate, negotiate, and lead cross-cultural engagements and teams. The course content is relevant and applicable to anyone interested in developing cross-cultural leadership competencies and cultivating a global mindset.
Restriction: Sophomore standing or higher; must be a minor in Global Engineering Leadership (#EN09), Global Poverty (#AG06), Global Terrorism Studies (#BS07), or International Development and Conflict Management (#BS02).
Credit Only Granted for: ENES472, SLLC471, or SLLC473.
Additional Information: Students not meeting restriction requirements should add themselves to the course holdfile. Restrictions DO NOT apply to winter and summer terms.

ENES474 Global Perspectives of Engineering (3 Credits)
Faculty supervised research on aspects of engineering in a foreign country including leading fields of research, key world markets, and the culture of the engineering workplace. Students will produce a comprehensive report exhibiting their expertise in their chosen country and the field of engineering within.
Prerequisite: ENES100; or permission of ENGR-A. James Clark School of Engineering.
Restriction: Must be in the International Engineering Minor.
Credit Only Granted for: ENES458M or ENES474.
Formerly: ENES458M.

ENES475 Leadership in Times of Crisis: Pandemics, Disasters, and Humanitarian Crises (3 Credits)
Students are provided with immersive opportunities to learn from industry professionals about crisis prevention and response by examining leadership throughout the crisis cycle: from identification, prevention, and preparation, to response, recovery, and rebuilding. The course brings together the study and practice of leadership with promising practices in disaster preparedness and data informed decision-making. This course will examine how leadership has been enacted to help local, national, and global communities navigate through pandemics, disasters, and other humanitarian crises. Students will develop capacities for informed leadership in times of crisis and develop an understanding for applying these skills in a variety of settings.
Restriction: Must have earned a minimum of 60 credits.
Credit Only Granted for: ENES275 or ENES475.

ENES478 Topics in Engineering Education (1 Credit)
Topics related to teaching engineering courses, particularly project-based courses. Topics can include learning styles, student development theory, multicultural issues in teaching, facilitating team experiences, assessment, and academic integrity.
Restriction: Must be in the Engineering Teaching Fellow program.
Repeatable to: 3 credits if content differs.

ENES480 Engineering Honors Seminar I (1 Credit)
Introduction to engineering leadership, professionalism, and ethics. Discussions of leadership style, elements of success, professional communication, codes of ethics, handling of ethical dilemmas, and the characteristics of a professional.
Restriction: Must be in College of Engineering Honors; and junior standing or higher.

ENES481 Engineering Honors Seminar II (1 Credit)
Introduction to engineering creativity and innovation in engineering. Application of methods of creativity to topics in communication, conducting research, and leadership.
Restriction: Must be in College of Engineering Honors; and junior standing or higher.

ENES489 Special Topics in Engineering (3-6 Credits)
Special topics in engineering.
Prerequisite: Permission of ENGR-A. James Clark School of Engineering.
Repeatable to: 6 credits if content differs.

ENES498 Special Topics in Entrepreneurship (3 Credits)
This entrepreneurship seminar and case study-based course will explore technology entrepreneurship with a focus on leadership, marketing, team-building, and management of new technology ventures and assumes baseline knowledge of entrepreneurship. Students will learn skills needed to succeed as a technology entrepreneur and how to apply best practices for planning, launching, and growing new companies. This course is a requirement of the Hinman CEOs program.
Restriction: Must be in Hinman CEOs Program.
Repeatable to: 12 credits if content differs.

ENES499 Senior Projects in Engineering (3 Credits)
Students will work in large teams to solve a multidisciplinary research/design problem. The course will begin with students identifying opportunities, brainstorming project concepts to address these opportunities, applying lean startup and design thinking strategies, and then selecting/proposing a project for the semester. Acceptable projects will require the multidisciplinary design, construction and testing of a project within limited budget and time constraints.
Prerequisite: Permission of ENGR-A. James Clark School of Engineering; and completion of all 1XX and 2xx level (lower-division) technical courses in engineering major with a C- or better.
Restriction: Must be in a major in ENGR-A. James Clark School of Engineering.
Repeatable to: 6 credits if content differs.

ENFP - Engineering, Fire Protection

ENFP101 Introduction to Fire Protection Engineering (1 Credit)
This course will introduce students to the impact of fire on people, property and the environment and methods to mitigate the threat of fire. Student teams will apply the principles of fire behavior and fire safety systems covered in the first half of the course to design, build and test a fire safe, small-scale apartment. A final experiment will be conducted to provide an assessment of the complete designs of each team.
Restriction: Permission of ENGR-Fire Protection Engineering department.
Credit Only Granted for: ENFP108 or ENFP101.
Formerly: ENFP108.

ENFP201 Computer Programming and Numerical Methods in Fire Protection Engineering (3 Credits)
A broad range of numerical methods are illustrated and applications related to engineering problems are implemented with computer programming. The topics include: finding roots of equations with bracketing and open methods; solving linear systems of equations with matrices, Gauss elimination, LU decomposition, and iterative methods; linear regression, polynomial interpolation; numerical integration and numerical differentiation; ordinary and partial differential equations. Additional topics such as optimization, eigenvalues, Fourier analysis, splines, and Romberg integration may be included.
Prerequisite: MATH141.
Restriction: Must be in Engineering: Fire Protection program.

ENFP250 Introduction to Life Safety Analysis (3 Credits)
Introduction to fire protection engineering and building regulation focusing on building safety systems, egress system design and evacuation modeling.
Prerequisite: Permission of ENGR-Fire Protection Engineering department.
Credit Only Granted for: ENFP250 or ENFP251.
Formerly: ENFP251.

ENFP300 Fire Protection Fluid Mechanics (3 Credits)
Presents students with the fundamental properties of fluids and fluid movement. Both static and dynamic fluid problems will be considered with an emphasis on fire protection systems.
Prerequisite: MATH246 and ENFP201; and must have completed or be concurrently enrolled in PHYS260, PHYS261.
Restriction: Permission of ENGR-Fire Protection Engineering department.
Credit Only Granted for: BIOE331, ENCE305, ENFP300, or ENME331.

ENFP310 Water Based Fire Protection Systems Design (3 Credits)
Introduction to aqueous fire suppression. Discussion of key fluid dynamics and heat transfer processes in aqueous fire suppression. System design and performance analysis based on national standards, hydraulic theory and elementary fluid dynamics and heat transfer.
Prerequisite: ENFP300.
Corequisite: ENFP312.
Restriction: Permission of ENGR-Fire Protection Engineering department.

ENFP312 Heat and Mass Transfer (3 Credits)
Fundamentals of heat and mass transfer. Conduction, convection, and radiation modes of heat transfer. Diffusion concepts and evaporation phenomena. Problem solving techniques with application to fire problems.
Prerequisite: ENES232 and ENFP300.
Restriction: Permission of ENGR-Fire Protection Engineering department.
Credit Only Granted for: ENFP312 or ENME332.

ENFP350 Professional Development Seminar (1 Credit)
An integrative, upper level professional development seminar covering topics such as engineering ethics, professional licensing, codes and standards, intellectual property, career selection and various contemporary issues in fire protection engineering.
Prerequisite: Permission of ENGR-Fire Protection Engineering department.
Restriction: Junior standing or higher.

ENFP405 Structural Fire Protection (3 Credits)
Effects of elevated temperature on structural materials; steel, concrete, wood, gypsum, glass and reinforced plastics. Experimental evaluation of fire resistance of building assemblies. Analytical methods to evaluate fire resistance of structural members.
Prerequisite: ENES220.
Jointly offered with: ENFP621.
Restriction: Must be in Engineering: Fire Protection program; and permission of ENGR-Fire Protection Engineering department.
Credit Only Granted for: ENFP405 or ENFP621.

ENFP410 Special Hazard Suppression Systems (3 Credits)
Analysis of application and theory of fire suppression systems. The key elements of fire suppression systems will be discussed along with how they interact for effective fire suppression design. Physical mechanisms for a variety of fire suppression approaches will be discussed including hose streams, sprinklers, water mist, foam, clean agents, and chemical agents.
Prerequisite: ENFP310 and ENFP312.
Jointly offered with: ENFP610.
Restriction: Permission of ENGR-Fire Protection Engineering department.
Credit Only Granted for: ENFP410, ENFP610 or ENFP653.

ENFP411 Risk-Informed Performance Based Design (3 Credits)
Appraisal and measurement of fire safety. Application of systems analysis, probability theory, engineering economy and risk management in the identification and synthesis of components of fire protection engineering. Methods for the development of criteria for the design, evaluation and assessment of fire safety or component hazards.
Restriction: Senior standing; or permission of ENGR-Fire Protection Engineering department.

ENFP413 Human Response to Fire (3 Credits)
Fractional effective dose (FED) methods for predicting time to incapacitation and death of fires for use in fire safety calculations. Physiology and toxicology of the fire effluent components, decomposition chemistry of common materials, standard experimental approaches. Predictive models of material production rates. People movement characteristics related to building evacuation. Formulation and application of evacuation models. Human behavior factors affecting response of people to fire situations.
Prerequisite: ENFP250.
Restriction: Permission of ENGR-Fire Protection Engineering department. Jointly offered with ENFP613.
Credit Only Granted for: ENFP413 or ENFP613.

ENFP415 Fire Dynamics (3 Credits)
Designed to give students a quantitative understanding of fire behavior. The fundamentals of physics and chemistry of combustion are presented and used to derive key analytical relationships that describe fire growth. Application of these relationships to the analysis of common fire scenarios is emphasized.
Prerequisite: ENFP312.
Restriction: Permission of ENGR-Fire Protection Engineering department. Jointly offered with ENFP651.
Credit Only Granted for: ENFP415 or ENFP651.

ENFP420 Fire Assessment Methods and Laboratory (4 Credits)
Experimental evaluation of ignition, flame spread, rate of heat release and smoke production of flammable gases, liquids, solids, and interior finish materials. Analytical and computer methods for the design, performance, and analysis of fire experiments. Preparation of laboratory reports.
Prerequisite: Student must have senior standing; and minimum grade of C- in ENFP312.
Restriction: Must be in Engineering: Fire Protection program.
Credit Only Granted for: ENFP320 or ENFP420.
Formerly: ENFP320.

ENFP425 Enclosure Fire Modeling (3 Credits)
An introduction to enclosure fire dynamics through the development of fire modeling algorithms and the application of computer-based fire modeling techniques. The objectives of the course are: to provide a basic understanding of enclosure fire dynamics with an emphasis on a system-level viewpoint (i.e., a global description of the coupling between combustion dynamics, smoke filling, vent flows and heat transfer); and to provide an introduction to the zone modeling approach. Topics covered include a review of the mathematical formulation of zone models, a discussion of numerical integration of the zone modeling equations (using MATLAB), and an introduction to zone modeling software used by professional engineers (e.g., CFAST).
Prerequisite: ENES232, ENFP300, and ENFP312.
Restriction: Must be in Engineering: Fire Protection program; and senior standing; and permission of ENGR-Fire Protection Engineering department.

ENFP426 Computational Methods in Fire Protection (3 Credits)
Introduction to computer-based fire modeling: zone modeling and Computational Fluid Dynamics (CFD); documentation of input data, validation and verification tests.
Recommended: ENFP425.
Restriction: Permission of ENGR-Fire Protection Engineering department.

ENFP429 Independent Studies (1-3 Credits)
For students who have definite plans for individual study of approved problems, or study of an advanced topic selected in conjunction with the faculty.
Prerequisite: Permission of ENGR-Fire Protection Engineering department.
Restriction: Must be in Engineering: Fire Protection program.
Repeatable to: 6 credits if content differs.

ENFP440 Smoke Management and Fire Alarm Systems (3 Credits)
Analysis of hazard posed by smoke in buildings. Performance characteristics of smoke management systems. Review of analytical design aids. Functional analysis and design of fire detection and alerting systems. Examination and evaluation of code criteria, performance specifications and research.
Prerequisite: Must have completed with a C- or better or concurrently be enrolled in ENFP300.
Jointly offered with: ENFP627.
Restriction: Permission of ENGR-Fire Protection Engineering department.
Credit Only Granted for: ENFP440 or ENFP627.

ENFP461 Think Tank (3 Credits)
Designed to have the student apply critical thinking in both engineering and business terms through a unique combination of student-driven, competition-based, long-term, targeted learning.
Recommended: Junior standing in fire protection engineering.
Restriction: Permission of ENGR-Fire Protection Engineering department.

ENFP464 Industrial Fire Safety (3 Credits)
Designed to introduce students to the basics of process safety with a focus on the methods and techniques that may be utilized when evaluating the existing or proposed safety protection solutions in industrial facilities. An emphasis is placed on properly identifying the hazards that are present, the risk exposure, and how best to address the risk. The foundation is laid by presenting the necessary background information on industrial processes and integrating this information with applicable fire/explosion safety science.
Prerequisite: Students must be of senior standing.
Restriction: Permission of ENGR-Fire Protection Engineering department.
Also offered as: ENFP664.
Credit Only Granted for: ENFP464, ENFP489I, ENFP629I OR ENFP664.
Formerly: ENFP489I.
Additional Information: The course will be taught as a dual senior-level undergraduate course and graduate course.

ENFP465 Fire and Explosion Investigations (3 Credits)
This course covers many aspects of fire and explosion investigation and reconstruction. Information on field techniques, applicable standards, and best practices are presented with an emphasis on how fire science and fire dynamics can be applied to forensic analysis. Experiments are performed and analyzed to demonstrate the concepts.
Prerequisite: Student should have senior standing.
Jointly offered with: ENFP665.
Restriction: Permission of ENGR-Fire Protection Engineering department.
Credit Only Granted for: ENFP489N, ENFP629N, ENFP465 OR ENFP665.
Formerly: ENFP489N.

ENFP467 Wildland Fires: Science and Applications (3 Credits)
Introduction to the global problem of wildland fires with an overview of the social, political and environmental issues posed as well as detailed coverage of the science, technology and applications used to predict, prevent and suppress wildland fires.
Prerequisite: ENFP312.
Restriction: Must be in Engineering: Fire Protection program; and permission of ENGR-Fire Protection Engineering department.
Credit Only Granted for: ENFP489W, ENFP629W, or ENFP667.
Formerly: ENFP489W.

ENFP489 Special Topics (3 Credits)
Selected topics of current importance to fire protection.
Prerequisite: Permission of ENGR-Fire Protection Engineering department.
Repeatable to: 6 credits.

ENGL - English

ENGL101 Academic Writing (3 Credits)
An introductory course in expository writing.
Additional Information: Students must complete this course with a minimum grade of C- in order to fulfill the General Education Fundamental Studies Academic Writing requirement.

ENGL120 Acting Human: Shakespeare and the Drama of Identity (3 Credits)
Shakespeare's ideas of dramatic realism studied through close examination of literary and dramatic techniques. How Shakespeare generates the fiction of a living, thinking person in the space of five acts, and how readers participate in the making of that fiction. Some attention to Shakespeare on film and what the playwright can teach us about different media.

ENGL121 The Power of Song: Renaissance Lyric and Its Afterlives (3 Credits)
Examines the power that song has over its audiences. Drawing on literary, performance, and sound studies, we will investigate how song takes hold of its listeners in uniquely moving ways. We will examine the special appeal of song in early modern England, including works by William Shakespeare, John Milton, and William Byrd. And we will compare the song culture of the English Renaissance to the power of song in contemporary life, from Kendrick Lamar to CocoRosie.

ENGL125 Why Poetry Matters (3 Credits)
Poetry is most often understood as self-expression; it's also communal expression, and cultural expression; it's also a particular kind of construction made out of language. Explore the art form called poetry, including its formal properties, its conventions, and its legacy of experimentation. What role does poetry play in how we think about the human condition; what constitutes knowledge and wisdom, interior subjectivity and collective identity; and how shall this knowledge be used in confronting new challenges and the perennial questions: how to live with oneself, and as oneself; in time, and with others; here, where we reside; and elsewhere, where we imagine ourselves going. This is a hands-on course in reading and practicing the art of poetry, including short critical and creative writing exercises.

ENGL126 Why Fiction Matters (3 Credits)
Consider how short stories, novellas, and novels are vital to understanding our world and ourselves. Read and analyze a diverse range of twentieth- and twenty-first-century fiction, and apply the techniques of form and craft to your own experiments in fiction writing. Use critical analysis and hands-on creative experimentation to explore how fiction helps us understand the past, engage in the present, and build a better future.

ENGL130 Race and the Cultural Politics of Blood: A Historical Perspective (3 Credits)
Exploration of race, as term and concept, at three different historical times and from three different perspectives, through the reading of three stories: William Shakespeare's drama Othello, Aphra Behn's novella Oroonoko, and the short story Benito Cereno by Herman Melville. Exploration of the importance of context in interpretation. Study of how a concept for rationalizing human difference appears and adapts, fuses and fades away, relocates and is repurposed. How understanding of the particular situation of the concept, its context, changes our reading of the story.

ENGL132 Aliens, Exiles, and Immigrants (3 Credits)
Exploration of ideas, beliefs, and aspirations that immigrants carry from one nation to another. Different ways of understanding national and cultural identities, and ways the experiences of immigration have changed significantly over time. Readings examine historical and contemporary immigrant writing, including post-9/11 poetry and fiction; memoirs of nineteenth-century British emigrants to South Africa, Australia, and Canada; literature by emigrants from Asia, the Middle East, and Latin America now living in the United States; and writing by individuals displaced by war, famine, and political conflict. Politics of immigration and citizenship; historical and contemporary arguments for and against immigration and assimilation.

ENGL133 Imagining Nature (3 Credits)
Who gets to speak for nature? This course explores the long history of environmental writing in the context of the complex relationship between European and Indigenous North American traditions. We will not just survey environmental literature; we will inquire into the pressures under which contemporary ideas of nature evolved from a colonial past. Students will learn about the history of representing other-than-human actors in the world--including Indigenous ways of knowing--and how this history can help us envision new, shared relationships with the natural world.

ENGL134 The Rites of Discovery: Science, Law, and Literature, 1492-1992 (3 Credits)
History of idea of "discovery" from sixteenth-century debate about European "rights of discovery" to 500th anniversary, in 1992, of Columbus' landfall in New World. Evolution of modern concept of discovery, both as part of history of science and in legal context of history of European colonialism and cultural encounter with Native peoples of Americas, Africa, and Asia. Exploration of primary and secondary sources relating to international law, science, and literature.

ENGL140 American Fictions: U.S. Literature, History, Politics, and Constitutional Law (3 Credits)
Works of American literature explored in the context of major texts and developments of U.S. history, culture, politics, and constitutional law. We begin with the Declaration of Independence and the U.S. Constitution, and survey the course of American literature and history, from 1776 to the present, in relation to defining political and constitutional issues. Readings of canonical works like "Huckleberry Finn" and "The Grapes of Wrath" coupled with special attention to minority authors and issues, and horizons of constitutional contemplation opened up by minority, immigrant, and women's voices and experiences. Key historical and political issues include human rights; equal protection; religious tolerance; democratic principles; republican structures of government; independence; revolution; slavery; removal; immigration; free speech; labor rights; civil rights; feminism; environmentalism; international law and flows of people; economic globalization; technology and digital innovation; and the role that literature and the humanities play in fostering various forms of civil society, multiculturalism, and a globally accountable citizenship.

ENGL142 Literary Maryland (3 Credits)
What does the literature of Maryland teach us about our state's past, present, and future? "Literary Maryland" explores this question by taking students on a tour of our state's prose, poetry, and drama from colonization to the present. In addition to reading fascinating writing and visiting interesting places, you'll learn how the Chesapeake was formed; why nobody sings the entire national anthem; and what led Baltimore to name its football team after a poem written by a Virginian.
Credit Only Granted for: ENGL142 or ENGL289M.
Formerly: ENGL289M.

ENGL143 Visualizing Knowledge: From Data to Images (3 Credits)
Explores how technology and people shape our current age of information through the various forms of visually representing information. Visualizations do not show us things that are evident--visualizations make things evident. We will thus examine the history of visualization practices, the theories of image-making that guide their production, and the current state of the art. Students will engage critically with a wide range of information visualization practices to gain an understanding of the work involved in producing them and their histories. Students will also seek out contemporary visualizations, interact with the practitioners who produce them, and produce their own visualization as a response or critique.

ENGL146 Seeing the Present: Graphic Storytelling in the Age of Social Media (3 Credits)
We increasingly live in a world dominated by digital images: graphic narratives, data visualizations, tweets, GIFs, and computer animation. Students will learn how to critically analyze this digital visual rhetoric and how to become a skilled user of visual discourse. By examining a range of science fiction, graphic novels, photography, and films, we will develop a critical vocabulary for understanding the possibilities and perils of our digital image culture. We will apply this vocabulary to analyzing visual representations of contemporary political questions including: climate change, criminal justice, bio-technological transformations of the human, and the incorporation of algorithm-based platforms into everyday life.

ENGL152 What is Justice?: Literature and the Invention of Ethical Imagination (3 Credits)
Exploration of literature's unique ability to animate human passions underlying ethical dilemmas. How literary texts shape understanding of justice; how plays, novels, and films define, critique, challenge, and even alter society's comprehension of equity and inequity, crime and punishment, pardon and torture, and ideas about civil liberties and human rights. Attention to how writers have described just and unjust within their historical moment; crucial role of imagination in formation of ethical citizens across time.

ENGL154 Race, Children's Television, and the Legacies of Jim Henson (3 Credits)
How do children form ideas about race from television? We will approach this question by studying representations of race in children's television from the founding of the animation industry in the 1910s to educational programming epitomized by Sesame Street and the work of Jim Henson. We will also explore representations of race in the "Saturday Morning Cartoon Lineup" and in the subsequent proliferation of computer-generated images, gifs, and memes. Students will visit archives on campus pertaining to Jim Henson's work and reflect on what they find. Assignments will include a paper focused on critical analysis and self-reflection, and students will have the option of completing a multimedia project featuring video production, puppet making, or another creative means of producing a lesson for children.
Credit Only Granted for: ENGL154 or ENGL439J.
Formerly: ENGL439J.

ENGL181 English Grammar (1 Credit)
The basic structure of formal written English, including parts of speech, sentence patterns, standard punctuation, diction, and usage.
Restriction: Must not have completed JOUR181 or ENGL181.
Credit Only Granted for: ENGL181 or JOUR181.

ENGL201 The Medieval Imagination (3 Credits)
How and why do the Middle Ages resonate with us now? Explore a wide range of narratives, poems, artworks, and songs from ancient, medieval, and Renaissance cultures. Study popular culture, manuscript and print technologies, and the relationship between the sacred and the profane over a millenium. Learn about modern and contemporary medievalist revivals that might include authors such as J.R.R. Tolkien and N.K. Jemisin, television series such as Game of Thrones, and more.

ENGL222 American Literature(s) (3 Credits)
Explore American literary traditions in a variety of poetic and narrative forms and in diverse historical contexts, ranging from colonization to the Civil Rights Movement and beyond. Genres examined in this course might include lyric poems, travel narratives, gothic short fiction, slave narratives, and science fiction. Emphasis on developing skills of literary interpretation and critical writing, while attending to the place of race, class, gender, and sexuality in American literary culture. Authors may include Phillis Wheatley, Herman Melville, Walt Whitman, Emily Dickinson, Frederick Douglass, Gertrude Stein, F. Scott Fitzgerald, James Baldwin, and Toni Morrison, among others.

ENGL233 Asian American Literature and Culture (3 Credits)
What is the role of literature in the lives of contemporary Asian Americans? How do Asian American authors imagine identity, violence, and social justice? Consider the role of Asian American literature in forming our understanding of past and present Asian America, and explore Asian American cultures and experiences.
Cross-listed with: AAST233.
Credit Only Granted for: ENGL233 or AAST233.

ENGL234 African-American Literature and Culture (3 Credits)
An exploration of the stories black authors tell about themselves, their communities, and the nation as informed by time and place, gender, sexuality, and class. African American perspective themes such as art, childhood, sexuality, marriage, alienation and mortality, as well as representations of slavery, Reconstruction, racial violence and the Nadir, legalized racism and segregation, black patriotism and black ex-patriots, the optimism of integration, and the prospects of a post-racial America.
Cross-listed with: AAAS234.
Credit Only Granted for: ENGL234, AAAS234 or AASP298L.

ENGL235 U.S. Latinx Literature and Culture (3 Credits)
Examines the poetry, prose, and theater of Latinx communities in the United States from their origins in the Spanish colonization of North America to their ongoing development in the 21st century. Considers how authors use literary form to gain insight into human experience, including mortality, religious belief, gender and sexuality, war and peace, family, language use, scientific inquiry, cultural tradition, ecology, and labor. Also studies how Latinx literary traditions have shaped and been shaped by broader currents in American literature, as well as what connections exist between Latinx literature and social and artistic developments in other parts of the world, particularly Latin America and the Caribbean. Authors may include Alvar Nunez Cabeza de Vaca, Eulalia Perez, Juan Nepomuceno Seguin, Maria Amparo Ruiz de Burton, Jose Marti, Arthur A. Schomburg, Jesus Colon, Julia de Burgos, Cesar Chavez, Ariel Dorfman, Gloria Anzaldua, Junot Diaz, and Cristina Garcia.
Cross-listed with: AMST298Q.
Credit Only Granted for: ENGL235 or AMST298Q.

ENGL241 What Novels Do (3 Credits)
Novels offer spaces for realist expression, and they also push the boundaries of fiction and imagination. Explore consciousness, community, belonging, philosophy, and human difference in a range of national and cultural traditions. Study how novels present thought in radically different ways, crossing lines of class, gender, chronology, and locale.

ENGL243 What is Poetry? (3 Credits)
An exploration of arguably the most complex, profound, and ubiquitous expression of human experience. Study through close reading of significant forms and conventions of Western poetic tradition. Poetry's roots in oral and folk traditions and connections to popular song forms.

ENGL244 Drama, Performance, and Spectacle (3 Credits)
Exploration of drama through a consideration of plot, narrative flow, analytical flow, staging, performance, manuscript and printing history, text and textual change over time, and interpretation. Plays will be approached as public attempts to understand what it means to be alive.

ENGL245 Film Form and Culture (3 Credits)
Introduction to film as art form and how films create meaning. Basic film terminology; fundamental principles of film form, film narrative, and film history. Examination of film technique and style over past one hundred years. Social and economic functions of film within broader institutional, economic, and cultural contexts.
Cross-listed with: CINE245.
Credit Only Granted for: ENGL245, CINE245 or FILM245.
Formerly: FILM245.

ENGL246 The Short Story (3 Credits)
Explore how short stories quickly take hold of the imagination. Topics may include historical developments in the genre of the short story, popular trends in short fiction, short stories in diverse cultures, the short story collection as a unique form, and how the short story differs from the novel, the novella, and flash fiction.

ENGL250 Reading Women Writing (3 Credits)
Explores literary and cultural expressions by women and their receptions within a range of historical periods and genres. Topics such as what does a woman need in order to write, what role does gender play in the production, consumption, and interpretation of texts, and to what extent do women comprise a distinct literary subculture. Interpretation of texts will be guided by feminist and gender theory, ways of reading that have emerged as important to literary studies over the last four decades.
Cross-listed with: WGSS255.
Credit Only Granted for: ENGL250, WMST255 or WGSS255.
Formerly: WMST255.

ENGL251 Detective Fiction (3 Credits)
Explore "whodunnit" fiction from its nineteenth-century beginnings to the contemporary moment. Why are readers intrigued by the methodical discovery of the exact circumstances of a mysterious event? How does the figure of the eccentric, intelligent, often unofficial investigator take prominence? How does detective fiction emerge from and react to global imperialism, the modern metropolis, forensic science, and the modern legal system? How does the genre represent and respond to gender, class, and racial inequities? Texts may range from the works of Edgar Allan Poe and Arthur Conan Doyle, to the "Golden Age of Detective Fiction" in the 1920s and 30s by writers such as Agatha Christie, to late-twentieth century and contemporary novelists such as Chester Himes, P.D. James, and Mia P. Manansala, to film and television adaptations such as Enola Holmes, See How They Run, and Kenneth Branagh's Hercule Poirot films.

ENGL254 Introduction to Humanities, Health, and Medicine (3 Credits)
An overview of the historical, cultural, ethical, and spiritual dimensions of medicine, human health, disease, and death from the points of view of various humanistic disciplines.
Cross-listed with: ARHU230, HIST219N, WGSS230.
Restriction: Permission of ARHU-History Department.
Credit Only Granted for: ARHU230 , ENGL289C, ENGL254, ARHU298A, HIST219N, or WGSS230.

ENGL255 Literature, Science, and Technology (3 Credits)
Consider the relationship between fiction and science. How does science as we know it depend on certain fictions or narratives? How do we come to know science through the fictions we encounter? How do literary works represent the ethics of science and technology? What role does science play in the oppression of peoples? What alternative, more liberatory ways of using science are possible?

ENGL256 Fantasy Literature (3 Credits)
How fantasy employs alternate forms of representation, such as the fantastical, estranging, or impossible, which other genres would not allow. Through novels, short stories, graphic novels, and film, traces fantasy's roots in mythology and folklore, then explores how modern texts build upon or challenge these origins. Examination of literary strategies texts use to represent the world through speculative modes. How to distinguish fantasy from, and relate it to, other genres such as horror, fairly tales, and magical realism. Fantasy's investment in world-building, history, tradition, and categories of identity such as race, class, and gender. How fantasy, as a genre, form, and world-view, is well-suited to our contemporary reality.

ENGL257 Children's Literature (3 Credits)
Literature of the nineteenth through the twenty-first century concerned with, and written for, children and young adults. How such narratives speak to themes of changing social, religious, political, and personal identity. Through poetry, novels, graphic novels, and film, explores how children's tales encapsulate and reflect on human existence, while pushing boundaries of what constitutes "children's literature" and what exactly defines the "child." Considers questions of literary classification through investigation of political and religious issues, gender politics, animal rights, social justice, race, war, and what it means to "grow up."

ENGL262 Introduction to the Hebrew Bible/Old Testament (3 Credits)
Origins of the Hebrew Bible (Old Testament), with attention to literary formations, archaeology, and social-political settings. Explorations of major questions, including who wrote the Bible, and when; relationships of the biblical tradition to the mythology and religious structures of ancient Israel's near eastern neighbors; and dynamics of politics, religious leadership, and law.
Cross-listed with: JWST262, HEBR298B.
Credit Only Granted for: JWST262, HEBR298B, or ENGL262.

ENGL264 What Are the Liberal Arts? (3 Credits)
Explore what we call "the liberal arts" and "the humanities," which have historically formed the foundations of higher education. What is the role of learning in human life, and what are the ultimate ends of education? How does the idea of a liberal arts education take shape--from ancient Greece, to the medieval world, to the post-Enlightenment explosion of the sciences, to the modern disciplines of the humanities? What can you expect from the humanities curriculum at the University of Maryland, as opposed to a liberal arts college such as St. Johns College in Annapolis?
Cross-listed with: ARHU264.
Credit Only Granted for: ENGL264 or ARHU264.

ENGL265 LGBTQ+ Literatures and Media (3 Credits)
A study of literary and cultural expressions of queer and trans identities, positionalities, and analytics through an exploration of literature, art, and media. We will examine historical and political power relations by considering the intersections of sexuality and gender with race, class, nation, and disability. Topics include the social construction and regulation of sexuality and gender, performance and performativity, intersectionality, and the relationship between aesthetic forms and queer/trans subjectivity. Our interpretations will be informed by queer and trans theories.
Cross-listed with: LGBT265.
Restriction: Must not have completed LGBT265.
Credit Only Granted for: ENGL265 or LGBT265.

ENGL269 Special Topics in Study Abroad II (1-6 Credits)
Special topics course taken as part of an approved study abroad program.
Repeatable to: 15 credits if content differs.

ENGL269M Morocco: In the Footsteps of the Beat Generation (3 Credits)
Educates students about the history, culture and socio-political situation in Morocco through the reading of fiction related to this country. The focus will be on the intersection of American and Moroccan culture and will cover film, music and literature. The American perception of the "orient" has historically been channeled through the French characterization of Arab societies in North Africa. This course aims to disentangle this western mythology from reality in Morocco. Some of the themes addressed will be globalization, colonialism, racism, orientalism, and women's oppression
Cross-listed with: ARHU269A.
Credit Only Granted for: ARHU269A or ENGL269M.

ENGL271 Writing Poems and Stories: An Introductory Workshop (3 Credits)
Introduction to theory and practice of writing fiction and poetry. Emphasis on critical reading of literary models. Exercises and workshop discussions with continual reference to modeling, drafting, and revising as necessary stages in a creative process.

ENGL272 Writing Fiction: An Introductory Workshop (3 Credits)
Introduction to theory and practice of writing fiction. Emphasis on critical reading of literary models. Exercises and workshop discussions with continual reference to modeling, drafting, and revising as necessary stages in a creative process.

ENGL273 Writing Poetry: An Introductory Workshop (3 Credits)
Introduction to theory and practice of writing poetry. Emphasis on critical reading of literary models. Exercises and workshop discussions with continual reference to modeling, drafting, and revising as necessary stages in a creative process.

ENGL274 Creative Writing Through The Eyes of African Americans: A Beginning Workshop (3 Credits)
Introduction to theory and practice of writing fiction, drama and poetry, with an emphasis on African American literary models. Critical reading, exercises and workshop discussions with continual reference to modeling, drafting, and revising as necessary stages in a creative process.
Restriction: Must not have completed ENGL271, ENGL274, ENGL294,or AASP274. Cross-listed with AASP274.
Credit Only Granted for: ENGL274 or AASP274.

ENGL275 Writing for the Stage and Screen: An Introductory Workshop (3 Credits)
Introduction to the theory and practice of scriptwriting with an opportunity to read, view, evaluate, write, and revise texts meant to be performed. Students will practice writing for the stage, film, and television and also examine selected scripts, performances, and film and television clips as models for their own creative work. Students will complete frequent writing exercises, participate in workshops, and learn to apply scholarship to the analysis and critique of scripts.
Cross-listed with: ARHU275.
Credit Only Granted for: ENGL275 or ARHU275.

ENGL278 Special Topics in Literature (3 Credits)
Repeatable to: 9 credits if content differs.

ENGL280 The English Language: Histories, Diversity, and Change (3 Credits)
Explore the many structures and historical developments of the English language, with a focus on techniques of linguistic analysis. Major topics include the sound systems of English and its patterns of word formation and sentence structure, and the ways these have changed over time and vary around the world.

ENGL281 Standard English Grammar, Usage, and Diction (3 Credits)
Study of the structures and patterns of English grammar. The focus is on the standard dialect and contemporary usage, but we will also explore variation over time and across dialects. Includes word formation, sentence elements and structures, and conventions of punctuation, as well as the social aspects of grammatical choices.

ENGL282 How Rhetoric Works: Persuasive Power and Strategies (3 Credits)
Examines how persuasion functions and influences our lives and perception, focusing on a variety of contexts: business, politics, media, law, and entertainment. Students learn persuasive and argumentative principles to understand what rhetoric is, how it works, and what it does, and to apply the knowledge to produce effective communication appropriate for their purpose, audience, and context. A wide range of persuasive media, genres, and forms will be studied to help students sharpen how they interpret and practice persuasion.

ENGL289 Special Topics in English (3 Credits)
Introduces students to notable themes and approaches in English studies. Topics vary by section and semester.
Repeatable to: 12 credits if content differs.

ENGL289I Gender and Science in Film and Media (3 Credits)
Isaac Azimov once said of science fiction that it is the genre that "deals with the reaction of human beings to changes in science and technology." With this definition in mind, we will embark on a critical exploration of sci-fi film and other media, using it as a lens for analyzing society's deepest fears and most furtive hopes. Our investigation will center on the liminal space between hegemonic culture and its prescribed excesses. These liminal spaces--between self and other, disability and enhancement, cultural hybridization, and gender crossing--shift in response to real-world sociopolitical tensions. We will consider feminist and anti-racist media scholars' concerns over representation, authorship and ideology alongside questions of technological change. Students will use analytical and creative assignments to explore not only how the scientific imaginary serves as fertile ground for feminist, disability, and anti-racist critique, but also provides a locus for alternative futures.
Cross-listed with: WGSS280.
Credit Only Granted for: ENGL289I or WGSS280.

ENGL289J Monsters and Racism: Black Horror and Speculative Fiction (3 Credits)
The previous decade has been considered a renaissance for Black Horror. From Get Out to Lovecraft Country, the genre has enjoyed unprecedented mainstream media buzz and accolades. This course looks at contemporary Black horror and speculative fiction as cultural texts which put into question our notions of human(e) and inhuman(e) through critiques of white supremacy and accompanying oppressions. Students will learn a host of critical skills through close reading and analysis of literature and film by Black creators such as Jordan Peele, Misha Green, Toni Morrison, Jewelle Gomez, and Octavia Butler. With the ability to interpret cultural texts using literary criticism, film analysis, history, cultural studies, ethnic studies, feminist theory, and the social sciences, students will connect these texts to continuing historical and contemporary issues of racial and cultural oppression such as medical discrimination, policing and criminalization, misogynoir, and racialized capitalism.
Cross-listed with: WGSS271, AAAS271.
Credit Only Granted for: AAAS271, ENGL289J, HONR299Y, HNUH238W, WGSS271 or WGSS298W.
Formerly: HNUH238W.

ENGL289Q Quantum Steampunk Science-Fiction Workshop (3 Credits)
Steampunk is a science-fiction genre in which futuristic technologies populate Victorian-era settings. Recently, steampunk has come to life in the scientific field of quantum thermodynamics. Thermodynamics, the study of energy, grew out of the Industrial Revolution. Two centuries later, quantum physics is transforming computing and cryptography. Quantum science is now revolutionizing 19th-century thermodynamics in quantum thermodynamics, which features quantum engines, automata, and more. Quantum thermodynamics inspired the growing subgenre of quantum steampunk. In this course, you will read science fiction, write quantum steampunk short stories, receive feedback, and critique classmates' writing. In parallel, you will learn about quantum physics, technologies, and thermodynamics.
Cross-listed with: ARHU270, CHEM298Q, CMSC298Q, ENME299Q, PHYS299Q.
Credit Only Granted for: ARHU270, ARHU298Q, CHEM298Q, CMSC298Q, ENGL289Q, ENME299Q or PHYS299Q.

ENGL290 Introduction to Digital Studies (3 Credits)
Introductory course in digital studies. Surveys contemporary humanities work in digital technologies, including the web and social media and their historical antecedents. Explores design and making as analytical tools alongside reading and writing. Situates digital media within power and politics and develops critical awareness of how media shape society and ethics. Interdisciplinary approaches to creativity, analysis, and technology. While the course will include hands-on practice, no prior experience of programming, designing, or making required other than a willingness to experiment and play.

ENGL291 Writing, Revising, Persuading (3 Credits)
Intermediate-level, writing-intensive course for students who have successfully satisfied the Fundamental Studies Academic Writing requirement but wish to hone skills in analyzing and producing rhetorically attuned, well-styled prose. Deeper study of rhetorical theory and its application to a wide variety of arguments and situations. Additional writing practice, techniques of revision, study of effect of stylistic choices. Topics may include argumentation theory, visual rhetoric, stylistic theory, and writing theory.
Prerequisite: Must have satisfied Fundamental Studies Academic Writing requirement.

ENGL292 Writing for Change (3 Credits)
Service learning in collaboration with students at area high schools. Explores how writing can be a tool for social change. Participants serve as mentors, create a performance event concerning a pressing social issue, and compose reflections, literacy narratives, publicity materials, and a multimodal project. Focus on developing critical self-awareness.
Prerequisite: Permission of ARHU-English department.
Recommended: ENGL101.
Jointly offered with: ENGL388C.
Restriction: Requires application and references.
Credit Only Granted for: ENGL292 or ENGL388C.

ENGL293 Digital Writing and Content Creation (3 Credits)
A hands-on exploration of rhetoric, technology, and digital expression. Study a variety of digital writing and content creation platforms, and learn about theories and practices in digital communication. Learn to analyze and create the kinds of multimodal documents (websites, podcasts, videos) that constitute communication in a digital world.
Recommended: ENGL101.

ENGL294 Persuasion through Social Media (3 Credits)
Why are influencers canceled? What role does social media play in the spread of (mis)information? What is possible through social media activism? How does advertising work in online spaces? How do people use social media to discover and craft identity? What role do social media play in user wellbeing? Explore questions like these using ideas from rhetoric to develop critical awareness about power, ideology, and digital content. Learn to create effective, ethical social media content. Become a more informed reader and writer on social media across public, personal, and professional contexts.
Recommended: Fundamental Studies Academic Writing requirement.

ENGL295 Introduction to Digital Storytelling and Poetics (3 Credits)
What is the thread weaving through an animated visualization of economic data in a popular newspaper, an indie text-based videogame, a saucy twitter bot spitting out haikus, and an interactive digital essay? Storytelling--using whatever is at hand to communicate with audiences in evocative and connected ways. Combining technical and textual analysis with their own experiments in digital composition, students will learn to use new media techniques for the interpretation, creation, and dissemination of both critical and imaginative writing. From branching narratives to hypertext media and video games, to more recent developments in machine-generated poetry, XR, and embodied and location-based narrative, the methods and materials in this introductory course link creative expression and analysis of texts to contemporary conversations about social difference, representation, interface, and computation.

ENGL296 Reading and Writing Disability: Rights and Representation (3 Credits)
Locate and analyze disability in various settings, modes, and texts. Investigate the material and cultural effects of the language, stories, and myths of disability. Explore the many definitions and frameworks of disability: as dynamic lived experiences, as a political identity, as a rich culture, as socially constructed barriers, and as an oppressed minority group. Examine how disability is portrayed, controlled, stereotyped, and celebrated across social, medical, political, cultural, and personal networks.

ENGL297 Research and Writing in the Workplace (3 Credits)
Introduction to the rhetorical principles and professional practices of professional writing, particularly the research, writing, communication, analytical, and technological skills needed for the Professional Writing minor. How culture and technology relate to the work of professional writing; design principles and rhetorical moves; digital tools, research skills, and writing strategies of professional writers. Develops skills needed to publish a writing portfolio that showcases students' professional writing competencies and projects their professional writer identities.
Prerequisite: ENGL101.

ENGL301 This is English: Fields and Methods (3 Credits)
"English" means a lot of things. Are you looking for literature, or linguistics? For writing--creative, critical, or professional? For theater, or debate? For film, or even videogames? This gateway course for the English major introduces you to all of these areas and more, as well as to our discipline's unique resources for studying and enjoying them. The English discipline includes three main interpretive fields: Literary and Cultural Studies; Language, Writing, and Rhetoric; and Media Studies. This course brings together the fundamental concepts and methods for reading, viewing, and researching practiced in these fields, launching you into English studies and and helping you to choose the major track that is right for you.
Restriction: Must be in English Language and Literature program; or must be in Secondary Educ: English Language Arts program.

ENGL302 Medieval Literature in Translation (3 Credits)
Surveys major works of English and continental Middle Ages. Readings may include romance, lyric and drama, Germanic epic, works of Dante, Chretien de Troyes, Jean de Meun, Christine de Pisan, Malory, English and continental mystics.

ENGL305 Early Drama (3 Credits)
Explore medieval and Renaissance drama and performance, placing the Shakespearean stage in its cultural and historical contexts.

ENGL308 Special Topics in Shakespeare (3 Credits)
A topical exploration of William Shakespeare's plays and poems as well as their cultural contexts, performance history, and the roles they play in modern and contemporary culture.
Repeatable to: 12 credits if content differs.

ENGL310 Medieval and Renaissance British Literature and Culture (3 Credits)
Explore medieval and Renaissance literary cultures from Beowulf to Mary and Philip Sidney. Read poetry, drama, and narrative from the 10th to the 16th centuries, by authors such as Chaucer, Spenser, Donne, Marlowe, and Lanier. Learn about the history of gender and sexuality, race and class, feudalism and capitalism, philosophies of science and the natural world, manuscript and print cultures, religion, piracy, and witchcraft.

ENGL311 17th- and 18th-Century British Literature and Culture (3 Credits)
Explore 17th- and 18th-century British literary cultures. Read novels, political writing, poetry and drama by authors such as Milton, Behn, Swift, Equiano, and Wollstonecraft. Learn about the history of empire, colonialism, coffee house culture, female performance, science, philosophy, sexuality, and revolution.

ENGL312 Romantic to Modern British Literature and Culture (3 Credits)
Explore 19th- and 20th-century British and Anglophone literary cultures, including Romanticism, Victorianism, and Modernism. We will read poetry, prose, and drama by authors such as Mary and Percy Shelley to Austen, Dickens, Eliot, Tagore, and Woolf. Learn about the history of empire and resistance, the industrial revolution, capitalism, communism, feminism, race, and new forms of literary and artistic creation.

ENGL313 American Literature (3 Credits)
A detailed study of selected major texts of American literature from the 17th century to the 20th century. Issues such as race, gender, and regionalism. Authors such as Franklin, Hawthorne, Dickinson, Hemingway, and Morrison.

ENGL316 Native American Literature (3 Credits)
Examines literature that explores the experiences and cultures of America's Indigenous peoples from the sixteenth century to the contemporary moment. We will analyze poetry, historical accounts, oral narratives, short stories, and novels by Native American writers in order to explore key concerns in Native American Studies, such as dilemmas of Indigenous sovereignty, settler colonialism, the settler state, stolen land, and the natural environment.

ENGL317 African American Literature (3 Credits)
Consideration of key texts in African American literature that explore the experiences of people of African descent in America from the mid-nineteenth century to the contemporary moment. Relationship between literary texts, historical events and cultural formations. Examines a range of texts and genres (autobiography, slave narrative, travel narrative, poetry, essays, fiction), and their contribution to national literary tradition.

ENGL318 Special Topics in Digital and New Media Studies (3 Credits)
Explore digital and new media culture, narrative, poetics, and rhetoric. Topics may include creative expression in new media platforms and analytical approaches to electronic literature, social media, interactive fiction, literary datasets, digital writing, and artificial intelligence.
Repeatable to: 9 credits if content differs.

ENGL319 Special Topics in Science, Literature, and Media (3 Credits)
A topical investigation of the ways that science, art, and technology provoke ideas and innovation across their disciplinary boundaries within specific historical moments and locations.
Repeatable to: 12 credits if content differs.

ENGL321 Comics and the Graphic Novel (3 Credits)
Comics has become one of the most globally popular art forms of the twenty-first century, but it also has a rich history that stretches back to the eighteenth century, and arguably much earlier. This course will introduce students to the unique formal properties of comics and will survey the history of comics across national traditions, including texts drawn from the American, Franco-Belgian, and Japanese traditions. We will read across a range of genres and cultural registers--including newspaper strips, superhero comics, Underground comix, manga, the graphic memoir, and alternative comics. You will learn to analyze and write about the form and history of the medium.

ENGL327 The Suburbs in American Literature and Film (3 Credits)
Explores through written expression and through cinema the diverse and changing world of US suburbia. Premised on two arguments: (1) the suburbs embody many of the contours and contradictions of American life; and (2) the suburbs are far more racially, ethnically, culturally, sexually, economically diverse than mass media suggests. Investigation via prose, poetry, drama, and cinema, as well as secondary sources in sociology, women's studies, ethnic studies, history, cultural studies, psychology, anthropology, and the history of science and technology.

ENGL329 Special Topics in Film Studies (3 Credits)
Studies in various periods and genres of film.
Prerequisite: ENGL245, FILM245, FILM283, or SLLC283; or permission of ARHU-English department.
Repeatable to: 9 credits if content differs.

ENGL331 American Jewish Literature (3 Credits)
An exploration of the role played by literature in the development of American Jewish ethnic identity. Primary materials include essays, poetry, plays, short stories, novels, films and music.Cross-listed with JWST341.
Credit Only Granted for: ENGL331 or JWST341.

ENGL334 The Bible as Literature (3 Credits)
The Bible as a major source of contemporary Western religious symbolism and culture. Exploration of how this literary legacy appears in our own cultural experience. Historical critical and literary critical method and theory introduced and applied to the texts.

ENGL338 Special Topics in Literary and Cultural Studies (3 Credits)
Explore new topic areas in English literary and cultural studies.
Repeatable to: 12 credits if content differs.

ENGL344 The Novel in the 19th-Century World (3 Credits)
Explore 19th-century English-language novels drawn from around the world: England, Australia, India, South Africa, and the United States. Readings may include canonical novels (Charlotte Bronte's Jane Eyre and George Eliot's Middlemarch) as well as lesser known but extraordinary novels by authors such as Bankimchandra Chattopadhyay and Frances Harper. Topics to be addressed include realism, romance, nationalism, race and racial identity, feminism, sexuality, emigration, empire, and the function of the novel itself.

ENGL345 Poetry, Lyric, and Song (3 Credits)
Explore the forms, sounds, images, and experiences of poetry and song. How does poetic language grapple with human complexity and difference? What is the relationship between writing, orality, and music in the history of poetry? How do poets express and represent gender, sexuality, race, power, resistance, revolution, and cultural change? Reading and listening assignments might include balladry, sonnets, metaphysical poetry, free verse, hip-hop, popular music, and more.

ENGL346 Twentieth Century Fiction (3 Credits)
Major British, American, and other fiction writers of the twentieth century studied in the context of the broad global, intellectual, and artistic interests of the century.

ENGL348 Literary Works by Women (3 Credits)
The context, form, style and meaning of literary works by women.
Prerequisite: Must have completed at least one lower-level English literature course and one other lower-level English course; or Permission of the Harriet Tubman Department of Women, Gender, and Sexuality Studies.
Cross-listed with: WGSS348.
Repeatable to: 6 credits if content differs.
Formerly: WMST348.

ENGL349 Asian American Literatures (3 Credits)
Study of selected writers, particular themes, or genres in Asian American literatures.
Repeatable to: 9 credits if content differs.

ENGL352 Intermediate Fiction Workshop (3 Credits)
A class in the making of fiction. Intensive discussion of students' own fiction. Readings include both fiction and essays about fiction by practicing writers. Writing short critical papers, responding to works of fiction, and the fiction of colleagues, in-class writing exercises, intensive reading, and thinking about literature, in equal parts, and attendance at readings.
Prerequisite: Minimum grade of A- in ENGL271 or ENGL272; or permission of ARHU-English department.

ENGL353 Intermediate Poetry Workshop (3 Credits)
A class in the making of poetry. Intensive discussion of students' own poems. Readings in both poetry and essays about poetry by practicing poets. Writing short critical prose pieces, responding critically to colleagues' poems, in-class and outside writing exercises, memorization, and attendance at poetry readings.
Prerequisite: Minimum grade of A- in ENGL271 or ENGL273; or permission of ARHU-English department.

ENGL354 Intermediate Scriptwriting for Theater, Film, and Television (3 Credits)
Demystifies the art of dramatic writing. Students will come to understand that a play or screenplay is never a lecture, and that we write scripts to find out something about ourselves and the subjects we tackle. Students will analyze plays and screenplays, as well as workshop each others' scripts, to help them produce their own successful plays and screenplays written for the stage, screen, or box.
Prerequisite: 1 course with a minimum grade of A- from (ENGL275, ARHU375, THET340).

ENGL355 Digital Fictions (3 Credits)
Explores literary fiction composed and delivered in digital forms from the origins of computers in the mid-twentieth century to the present day. The course places equal emphasis on a historical survey of the intersection between the digital and the literary; on the enterprise of digital fiction as a dynamic and living form with new work appearing online almost every day; and on offering students the opportunity to experiment with digital platforms for fiction writing of their own. No technical expertise (or experience in creative writing) is expected or assumed.
Credit Only Granted for: ENGL355 or ENGL378C.
Formerly: ENGL378C.

ENGL358 Special Topics in U.S. Latinx Literature (3 Credits)
Topical study of selected works by U.S. Latinx writers.
Repeatable to: 9 credits if content differs.

ENGL359 Special Topics in LGBTQ+ Literatures and Media (3 Credits)
Selected study of a topic pertinent to literary and cultural expressions of LGBTQ+ identities, positionalities, and analytics through an exploration of literature, art, and/or media.
Cross-listed with: LGBT359.
Repeatable to: 9 credits if content differs.

ENGL359F Lesbian, Gay, Bisexual, and Transgender Film and Video (3 Credits)
Comparative analysis of forms, themes, and the politics of representation in film and video by and/or about LGBT people.
Cross-listed with: LGBT327.
Restriction: Junior standing or higher.
Credit Only Granted for: LGBT327 or ENGL359F.

ENGL360 African, Indian and Caribbean Writers (3 Credits)
Selected writers from countries formerly colonies of Britain, France, Denmark, etc. Attention to ways regions have developed distinctive political and aesthetic values resulting from indigenous traditions and foreign influences.

ENGL361 Recovering Oral Histories (3 Credits)
Service-learning course that gives students an opportunity to develop writing, interviewing, and communication skills as they contribute to the work of a community organization. In the classroom, students will reflect on the process and do background research to understand the particular context of the organization's work. In the field, students will interview (or have informal discussions with) young people helped by the organization in order to construct a narrative about their lives, their perceptions of themselves, and their experiences.
Prerequisite: Students must have completed one course in English, Latin American Studies, or Education.

ENGL362 Caribbean Literature in English (3 Credits)
Political and literary traditions that intersect in the fiction, poetry, and drama written in English by Caribbean writers, primarily during the 20th century.
Cross-listed with: LACS348E.
Credit Only Granted for: ENGL362, LASC348E, or LACS348E.

ENGL368 Special Topics in African American, African, and African Diaspora Literatures (3 Credits)
Topical study of selected literature by African American and Black Diaspora writers from Africa, the Caribbean, North and South America, and beyond.
Repeatable to: 9 credits if content differs.

ENGL369 Special Topics in Study Abroad III (1-6 Credits)
Special topics course taken as part of an approved study abroad program.
Repeatable to: 15 credits if content differs.

ENGL369D Australian Literature and Culture (3 Credits)
An immersion into Australian culture and history, this course will explore the literature, music, theater, and arts of Indigenous and contemporary Australia. Students will engage directly with matters of political and social concern, developing both awareness of cultural issues important to modern-day Australians and the skills needed to navigate those issues. Along the way, we will look back to the colonial founding of Australia as a British outpost and consider how modern Australia has emerged from a mixing of Western and Indigenous cultures.
Additional Information: This is an Education Abroad course.

ENGL369N New Zealand Literature and Culture (3 Credits)
An immersion into the literature, history, and culture of New Zealand, this course will look back to the colonial founding of New Zealand as a British outpost, and to the strong Maori culture the British encountered when they arrived. Students will engage directly with matters of political and social concern, developing both awareness of cultural issues important to modern-day New Zealanders and the skills needed to navigate those issues. Along the way, we will consider how modern New Zealand has emerged from a mixing of Western and Indigenous cultures.
Additional Information: This is an Education Abroad course.

ENGL370 Junior Honors Conference (1 Credit)
Preparation for writing the senior honors project.
Restriction: Candidacy for honors in English.

ENGL373 Senior Honors Project (2 Credits)
Research and writing of senior honors project. Strongly recommended for students planning graduate work.
Prerequisite: ENGL370.
Restriction: Must be in English Language and Literature program.

ENGL375 J.R.R. Tolkien: Middle-earth and Beyond (3 Credits)
An in-depth look at major themes and ideas spanning Tolkien's well-known and lesser-known works across a variety of genres and styles. We will study "The Hobbit" and "The Lord of the Rings" in connection with Tolkien's back-story mythology expressed in "The Silmarillion." We will also consider film adaptations and other popular fantasy influenced by Tolkien. And we will explore lesser-known works such as "Farmer Giles of Ham," and Tolkien's essays on fairy stories and on "Beowulf.

ENGL376 The Speculative Imagination: Science Fiction on Page and Screen (3 Credits)
Examines a global cross-section of science fiction in literature, film, television, comics, and other media. Studies the unique formal qualities of science fiction and traces its history from its origin in the eighteenth century to the present. Explores how the twenty-first century has brought new prominence to science fiction by creators of color, women creators, and queer creators, as well as intersections of these. Considers how science fiction addresses a range of phenomena--from environmental destruction to surveillance to imperialism and militarism. Students learn how to analyze and write about the formal and historical dimensions of the genre.
Credit Only Granted for: ENGL379Y or ENGL376.
Formerly: ENGL379Y.

ENGL377 Medieval Myth and Modern Narrative (3 Credits)
Literary patterns characteristic of medieval myth, epic, and romance; their continuing vitality in modern works; and links between Medieval works like "The Prose Edda", "Beowulf", "The Morte D'Arthur", "The Volsunga Saga", and "Grettis Saga" and modern narratives like Tolkien's "The Lord of the Rings".

ENGL378 Special Topics in English (3 Credits)
Offers sustained attention to notable current themes and approaches in English studies. Topics vary by section and semester.
Repeatable to: 12 credits if content differs.

ENGL379 Special Topics in Literature (3 Credits)
Repeatable to: 12 credits if content differs.

ENGL381 MGA Legislative Seminar (3 Credits)
Prepares students to intern for the Maryland General Assembly. Introduces standard legislative genres and assigns extended practice in researching legislative issues.
Prerequisite: Students who have taken courses with comparable content may contact the department; or ENGL101.
Cross-listed with: HONR368A.
Restriction: Permission of ARHU-English department.
Credit Only Granted for: HONR368A or ENGL381.
Additional Information: Application required. Contact english@umd.edu for more information.

ENGL383 Language in Its Social Contexts (3 Credits)
Exploration of the social and political aspects of language use, including interactional behavior, the structure of conversation, persuasive uses of language, social dialects, language use within speech communities, and language and identity. We will examine and compare analytical approaches to pragmatics and discourse analysis.

ENGL384 Concepts of Grammar (3 Credits)
Explore the nature of grammar from a variety of perspectives, developing the vocabulary and technical skills needed to identify and describe the basic grammatical structures of English words and sentences. Understand the structures used in all varieties of Present Day English, including formal and colloquial, spoken and written, and standard and non-standard dialects, with a focus on standard British and American varieties. Topics include grammatical categories, syntactic roles, phrase structure, and inflection. Consider why it is that languages should include such structures in the first place and how awareness of these structures might or might not help you become a more effective reader and writer. Emerge with a deeper understanding of the human mind and a new appreciation for the prodigious complexity of even the most trivial acts of language use.

ENGL385 English Semantics (3 Credits)
We use language all the time to share our thoughts and understand others, but how do we do this? Where does language get its meanings, and how do speakers know how to use them? Study a view of meaning grounded in human cognition and social interaction, emphasizing the relations between linguistic structures and the conceptual structures employed in understanding language. Topics include the relation between lexical and constructional meaning, the role of metaphor in language and thought, and the complex relations between language, culture and cognition.

ENGL386 Experiential Learning (3-6 Credits)
Prerequisite: Learning Proposal approved by the Office of Experiential Learning Programs, faculty sponsor, and student's internship sponsor.
Restriction: Junior standing or higher.

ENGL387 Visual Rhetoric (3 Credits)
Investigation of the persuasive power of visuals based on how they construct and communicate their content and predispose viewers to an interpretation or attitude. "Iconic" images and other modes of visual representation including diagrams, graphs, and page or screen design. Most attention given to a grammar and rhetoric of visuals. Also the elements of images and their arrangement and consideration of historical and generic contexts and the "affordances" of various media. Not a course in "high art" or in video, TV, or film. Emphasis on visuals that accompany or replace verbal texts.

ENGL388 Writing, Research, and Media Internships (1-6 Credits)
Explore career-facing opportunities on campus, in the D.C. metro area, and beyond. English internships can be individualized, working with businesses, not-for-profit organizations, state and federal governments, high schools, and incarcerated students. We also offer structured internship pathways with the Maryland General Assembly Program, the Emily Dickinson Electronic Archives, the Writing Center, our Undergraduate Teaching Assistant Program, and BookLab, our makerspace and letterpress printing studio.
Restriction: Permission of ARHU-English department.
Repeatable to: 18 credits if content differs.

ENGL388C Writing for Change (3 Credits)
Service learning in collaboration with students at area high schools. Explores how writing can be a tool for social change. Participants serve as mentors, create a performance event concerning a pressing social issue, and compose reflections, literacy narratives, and publicity materials. Students also design individual projects that link course content and students' own professional interests.
Prerequisite: Permission of ARHU-English Department .
Recommended: ENGL101.
Jointly offered with: ENGL292.
Restriction: Requires application and references.
Credit Only Granted for: ENGL292 or ENGL388C.

ENGL388M Maryland General Assembly Writing Internship (6 Credits)
Experiential learning at the Maryland General Assembly (early January through early April). Interns participate in standard office tasks, research legislative issues, and draft legislative texts such as constituent letters, notes on bills, newsletters, policy memos, and testimony. Specific assignments vary according to the host legislator's needs and the intern's schedule.
Prerequisite: ENGL381 or HONR368A.
Cross-listed with: HONR379W.
Restriction: Minimum cumulative GPA of 3.0; and must have earned a minimum of 60 credits; and must be admitted to the MGA program.
Credit Only Granted for: ENGL388M or HONR379W.

ENGL388P English Careers Internship (1-6 Credits)
Students receive credit for an internship of their choice that focuses at least half of its work on core English skills such as writing, editing, and research. Students secure their own internship placements. Course assignments include, for instance, an activity log, reflection papers, a supervisor evaluation, and a final portfolio of work.
Prerequisite: Permission of ARHU-English department.
Repeatable to: 12 credits if content differs.
Additional Information: Each enrolled credit equals 45 hours of on-site internship work.

ENGL388V Undergraduate Teaching Assistants in English (1-6 Credits)
A weekly teaching practicum and concurrent internship as an undergraduate teaching assistant in an English course. Students will explore the theories and best practices of teaching and learning in the various fields of the English discipline, particularly writing and literary studies. The emphasis is on creating inclusive classrooms and working with diverse learners and is grounded in theories of critical pedagogy. Students will apply principles of learning theory to develop and facilitate learner-centered lessons and discussions. They will also study composition pedagogy in preparation for responding to student writing in the course for which they are an assistant.
Prerequisite: Permission of the ARHU-English department.
Repeatable to: 12 credits.
Additional Information: Students should consult with the UTA Coordinator to determine the number of enrollment credits.

ENGL388W Writing Center Internship (1-6 Credits)
Examines face-to-face and online writing center theory and practice through readings, exercises, and supervised tutoring. Students investigate the writing process and help other writers to negotiate it.
Prerequisite: Permission of the Writing Center (1205 Tawes Hall).
Cross-listed with: SPAN388W.
Repeatable to: 12 credits.
Credit Only Granted for: ENGL388W or SPAN388W.

ENGL390 Science Writing (3 Credits)
Specifically designed for students interested in further study in the physical and biological sciences. Exposes students to the conventions of scientific prose in the genres of research articles and proposals. Students also learn to accommodate scientific information to general audiences.
Prerequisite: Must have fulfilled the Academic Writing (FSAW) requirement.
Restriction: Must have earned a minimum of 60 credits; and junior standing or higher.
Credit Only Granted for: ENGL390 or ENGL393S.
Formerly: ENGL393S.

ENGL391 Advanced Composition (3 Credits)
An advanced composition course which emphasizes constructing written arguments accommodated to real audiences.
Prerequisite: Must have fulfilled the Academic Writing (FSAW) requirement.
Restriction: Must have earned a minimum of 60 credits.

ENGL392 Legal Writing (3 Credits)
Conventions of legal writing and research. Students learn how to read and write about cases, statutes, or other legislation; how to apply legal principles to fact scenarios; and how to present a written analysis for readers in the legal profession. Assignments may include the law-school application essay, case briefs, legal memos, and client letters.
Prerequisite: Must have fulfilled the Academic Writing (FSAW) requirement.
Restriction: Must have earned a minimum of 60 credits.

ENGL393 Technical Writing (3 Credits)
Focuses on the writing of technical papers and reports.
Prerequisite: Must have fulfilled the Academic Writing (FSAW) requirement.
Restriction: Must have earned a minimum of 60 credits.

ENGL394 Business Writing (3 Credits)
Intensive practice in the forms of written communication common in the business world: letters, memos, short reports, and proposals. Focus on the principles of rhetoric and effective style.
Prerequisite: Must have fulfilled the Academic Writing (FSAW) requirement.
Restriction: Must have earned a minimum of 60 credits.

ENGL395 Writing for Health Professions (3 Credits)
Focus on accommodating health-related technical material and empirical studies to lay audiences, and helping writers to achieve stylistic flexibility and correctness.
Prerequisite: Must have fulfilled the Academic Writing (FSAW) requirement.
Restriction: Must have earned a minimum of 60 credits.

ENGL398 Topics in Professional Writing (3 Credits)
Professional writing courses that focus on the audiences, conventions, and genres of particular disciplines, professions, or organizations. Examples include writing for the arts, writing case studies and investigative reports, writing about economics, and writing for non-profit organizations.
Prerequisite: ENGL101; or students who have taken courses with comparable content may contact the department.
Restriction: Must have earned a minimum of 60 credits; and junior standing or higher.
Repeatable to: 6 credits if content differs.

ENGL398A Writing for the Arts (3 Credits)
Examines the situations and genres in which working professionals (practitioners, advocates, administrators, and educators) write about art, culture, and artists. The course covers the complex process that writers need to learn, including how to accommodate information to specific audiences, how to use stylistic and visual devices to make information more accessible, and how to edit their own work as well as that of their peers. Assignments parallel the writing demands that students will face in the workplace, including analyzing and composing artist statements, an arts manifesto, art education guides, press releases about artists and their work, critical reviews of exhibits and performances, and proposals to funding agencies and foundations.
Prerequisite: Must have fulfilled the Academic Writing (FSAW) requirement.
Restriction: Must have earned a minimum of 60 credits.

ENGL398B Writing for Social Entrepreneurship (3 Credits)
Designed for students who want to develop the skills needed to start a successful social venture--a start-up business with a social mission or a new nonprofit program. The course centers on a major writing project such as a business plan, a website design plan, a fundraising proposal, or a concept paper for a new nonprofit organization. Students produce other communication projects that social entrepreneurs use to develop their businesses and nonprofits, such as presentations or pitches to prospective investors/donors, marketing materials, and a job announcement. Students will learn from local social entrepreneurs who share their experiences of using writing to succeed in the field.
Prerequisite: Must have fulfilled the Academic Writing (FSAW) requirement.
Restriction: Must have earned a minimum of 60 credits.

ENGL398C Writing Case Studies and Investigative Reports (3 Credits)
Designed for students interested in becoming police investigators, educators, case workers, insurance adjusters, nurses, or program evaluators, or in entering branches of the social sciences that investigate cases and value reports based on accurate descriptions and compelling narratives. Such reports must be factual and yet useful to decision makers, unbiased and yet focused. Students study genres and language skills from careful summarizing to convincing storytelling.
Prerequisite: Must have fulfilled the Academic Writing (FSAW) requirement.
Restriction: Must have earned a minimum of 60 credits.

ENGL398E Writing About Economics (3 Credits)
Examines the characteristic genres of writing in modern economics, including theoretical and empirically based journal articles, reports for government and commercial clients, and economic information presented to a variety of non-professional audiences, such as citizen-oriented and public policy organizations. Students learn how to analyze these documents rhetorically and how to communicate economic information using the content, arrangement, style, and visual graphics best suited to the purposes and standards of particular audiences. Core assignments include a genre-based journal and document analysis, presentations on economics-related topics for both economists and non-professional audiences, and a major research-based writing project for an audience outside of the classroom.
Prerequisite: Must have fulfilled the Academic Writing (FSAW) requirement.
Restriction: Must have earned a minimum of 60 credits.

ENGL398G Tolkien in Oxford (3 Credits)
Would you like to know more about J.R.R. Tolkien and the mythology behind The Lord of the Rings? This course in advanced composition takes you behind the scenes of Middle-earth to Oxford, England, where Tolkien lived, studied, taught, and wrote. You will get a chance to visit the halls of Merton and Exeter College in Oxford University, conduct research at the Bodleian Library where many of Tolkien's manuscripts are housed, and hold writing workshops over meals in the same cozy inns frequented by Tolkien and his colleagues. This course satisfies both the University's Fundamental Studies requirement in Professional Writing and the heart's desire to follow in the footsteps of one of the 20th century's most influential world-builders and myth-makers.
Prerequisite: Must have fulfilled the Academic Writing (FSAW) requirement.
Restriction: Must have earned a minimum of 60 credits.

ENGL398L Scholarly Writing in the Humanities (3 Credits)
Examines scholarship in the humanities as a genre of professional writing and investigates the norms and procedures of advanced academic writing. Assignments parallel the writing demands that students will face in the academic workplace, including a graduate school application essay, a genre review, an annotated bibliography, a journal article, and an oral presentation of article subject matter.
Prerequisite: Must have fulfilled the Academic Writing (FSAW) requirement.
Restriction: Must have earned a minimum of 60 credits.

ENGL398N Writing for Non-Profit Organizations (3 Credits)
Examines professional writing and communication work in the non-profit sector. Students will analyze the audiences and document genres that they may encounter in real-world non-profit work and will learn how to compose many of these documents, from press releases and other public relations material to position papers, reports, and grant proposals. Students may also have the opportunity to add a service-learning component to the course by working with and for an area non-profit.
Prerequisite: Must have fulfilled the Academic Writing (FSAW) requirement.
Restriction: Must have earned a minimum of 60 credits.

ENGL398R Writing Non-Fictional Narratives (3 Credits)
Approaches nonfiction narrative-a kind of writing influenced by fiction, magazine journalism, memoir, and personal essay--as a form of professional writing used in publishing and a range of careers involving proposal writing, work documentation, lobbying, social marketing, and political commentary, among others. Students learn to use many of the same tools as fiction writers, such as dialogue, vivid description, developing characters, nonlinear structure, and shifts in tense, time, and points of view. They also learn how to edit their own work as well as that of their peers, doing multiple revisions of the major assignments for a final portfolio. Major assignments include essays targeted to specific publications, query letters, audience analysis, and a publisher analysis.
Prerequisite: Must have fulfilled the Academic Writing (FSAW) requirement.
Restriction: Must have earned a minimum of 60 credits.

ENGL398T Food Writing in Italy (3 Credits)
If food is language, what stories can it tell? What did ancient Romans eat? How and when did our ideas of "Italian" food become a fixed tradition? And what makes a pizza "authentic," anyway? This program allows students to explore such questions while steeped in the food culture of Rome and its surroundings. Taste of both Italian food's ancient traditions and modern trends; examine the cultural, historical, ethical, and environmental issues attendant to food consumption and production; and craft argumentative and expository food writing for real audiences across a number of genres, all in one of the world's most famous food destinations.
Prerequisite: Must have fulfilled the Academic Writing (FSAW) requirement.
Restriction: Must have earned a minimum of 60 credits.

ENGL398V Writing About the Environment (3 Credits)
Designed for those aspiring to work in a variety of fields that influence and are influenced by environmental science, including public policy, advocacy, science, and industry. Students learn to apply principles of technical writing to a range of scenarios and issues particular to the intersection of scientific knowledge and environmental policy. Writing audiences range from the public to decision-makers. The course emphasizes writing both within and across disciplines to enlist research for practical contexts.
Prerequisite: Must have fulfilled the Academic Writing (FSAW) requirement.
Restriction: Must have earned a minimum of 60 credits.

ENGL402 Chaucer (3 Credits)
Explore the works of Geoffrey Chaucer in their literary and cultural environment. Texts read in Middle English. Readings may include Canterbury Tales, Troilus and Criseyde, dream visions, and lyric poems.
Prerequisite: Two English courses beyond Fundamental Studies; or permission of ARHU-English Department.

ENGL403 Shakespeare: The Early Works (3 Credits)
Close study of selected works from the first half of Shakespeare's career. Generic issues of early histories, comedies, tragedies. Language, theme, dramatic technique, sources, and early modern English social-historical context.
Prerequisite: Two English courses beyond Fundamental Studies; or permission of ARHU-English Department.

ENGL404 Shakespeare: The Later Works (3 Credits)
Close study of selected plays from the second half of Shakespeare's career. Generic issues of later tragedies, later comedies, romances. Language, theme, dramatic technique, sources, and early modern English social-historical context.
Prerequisite: Two English courses beyond Fundamental Studies; or permission of ARHU-English Department.

ENGL408 Literature by Women Before 1800 (3 Credits)
Selected writings by women in the medieval and early modern era.
Prerequisite: Must have completed two English courses in literature; or permission of the Harriet Tubman Department of Women, Gender, and Sexuality Studies.
Cross-listed with: WGSS408.
Repeatable to: 9 credits if content differs.
Formerly: WMST408.

ENGL409 Study Abroad Special Topics IV (1-6 Credits)
Special topics course taken as part of an approved study abroad program.
Repeatable to: 15 credits if content differs.

ENGL410 Edmund Spenser (3 Credits)
Explore the works of Edmund Spenser in their literary and cultural environment. Special attention to The Faerie Queene; also sonnets and lyric poetry.
Prerequisite: Two English courses beyond Fundamental Studies; or permission of ARHU-English Department.

ENGL412 The Idea of Change in 17th-Century British Literature (3 Credits)
Explore the idea of change--from small adjustments in perspective to political revolutions--in the seventeenth century. We will take up literary experiments such as Edmund Spenser's terrifying vision of cosmic mutability in The Faerie Queene, John Donne's awareness of his vulnerable body as he endures the various stages of an illness, and Margaret Cavendish's embrace of science fiction to imagine new configurations of social life. Topics might include the Reformation and its aftermath; the scientific revolution; the English civil wars; the experience of religious conversion; shifting ideas of race and ethnicity; transatlantic travel and colonial expansion; the idea of "progress" and resistance to it; the agency of women in literary culture and political struggle; changing norms around sexual behavior and identity; and the unstable idea of literature itself. Authors may include Montaigne, Shakespeare, Jonson, Donne, Herbert, Galileo, Marvell, Hooke, Cavendish, Behn, and Milton.
Prerequisite: Two English courses beyond Fundamental Studies; or permission of ARHU-English Department.

ENGL414 Milton (3 Credits)
Explore the works of John Milton in their literary and cultural environment. Poetry and major prose, with special attention to Paradise Lost. Other works may include Samson Agonistes and shorter poems.
Prerequisite: Two English courses beyond Fundamental Studies; or permission of ARHU-English Department.

ENGL416 18th-Century British Literature and Culture (3 Credits)
The literatures of the Enlightenment grappled with a sea change in the understanding of humans, commodities, the planet, non-human animals, the body, newly-encountered "others," and God. Once called the "Age of Reason," novels, plays, and philosophy from this period in fact plumb passions, emotions, and sentiments through plots about love, exploitation, envy, crime, desire, and ambition. Satirists mocked everything from colonialism to virtue claims to satire itself. Read works that transformed what it meant to love, resist, exploit, and desire. Paradoxically, this "Age of Passions" elevated sympathy in the crucible of capitalism, invented human rights in the context of Empire; and formulated racial categories on the road to abolition and religious toleration. Authors might include Daniel Defoe, Eliza Haywood, Lady Mary Wortley Montagu, Bernard Mandeville, Jonathan Swift, Alexander Pope, Aphra Behn, William Congreve, Olaudah Equiano, and others.
Prerequisite: Two English courses beyond Fundamental Studies; or permission of ARHU-English Department.

ENGL420 British Romantic Literature and Culture (3 Credits)
Explore a time (roughly 1780-1830) of great change, political revolution, empire-building, changing economic and sexual relations, and philosophical innovation. Arguably, many of our contemporary notions about literature and what an author is were created during this period. Consider the influence of these changes in such authors as Blake, Wordsworth, Coleridge, Shelley, Keats, Byron, Godwin, Wollstonecaft, Austen, and more.
Prerequisite: Two English courses beyond Fundamental Studies; or permission of ARHU-English Department.

ENGL422 Empire, Urbanization, Aesthetics: Literature of the Global Victorian Era (3 Credits)
An age of cultural, political, and aesthetic upheaval, the Victorian period was a time of enormous social change: working-class agitation, struggles for women's rights, industrialization, imperial aggression, scientific discovery, and shifting ideas about race and colonialism. Through the study of novels, poems, and non-fiction prose, this course will consider how literature of the British nineteenth century engages with the disordered age in which it was composed. Authors may include Charles Dickens, Elizabeth Gaskell, Elizabeth Barrett Browning, George Eliot, Alfred Tennyson, and Mary Seacole, among others.
Prerequisite: Two English courses beyond Fundamental Studies; or permission of ARHU-English Department.

ENGL425 Identity, Acceleration, Revolt: British and Postcolonial Literatures Since 1900 (3 Credits)
Examine the innovations of modern and contemporary Anglophone literature in the midst of war and globalization, gender and sexual revolution, decolonization and shifting nationalisms, and technological and economic transformation. Authors might include Virginia Woolf, James Joyce, Derek Walcott, Salman Rushdie, Jeanette Winterson, and Chimamanda Ngozi Adichie.
Prerequisite: Two English courses beyond Fundamental Studies; or permission of ARHU-English Department.

ENGL428 Seminar in Language and Literature (3 Credits)
Topics will vary each semester. The course will provide a seminar experience in material or methodologies not otherwise available to the major.
Restriction: Junior standing or higher; and must be in the English Honors program or gain permission from the department.
Repeatable to: 12 credits if content differs.

ENGL429 Independent Research in English (1-6 Credits)
An advanced independent research project for qualified students, supervised by an English faculty member, on a topic not ordinarily covered in available courses.
Prerequisite: ENGL301; and two English courses (excluding fundamental studies requirement); and permission of ARHU-English department.
Restriction: Sophomore standing or higher.
Repeatable to: 9 credits if content differs.

ENGL430 Literature of the Americas from First Contact to Revolution (3 Credits)
Examines the literature of the cultural encounters, colonialisms, empires, and independence movements in the early Americas from 1492 through the eighteenth century. Writers typically include Christopher Columbus, John Smith, Anne Bradstreet, Jonathan Edwards, William Byrd, Olaudah Equiano, Phillis Wheatley, and Benjamin Franklin.
Prerequisite: Two English courses beyond Fundamental Studies; or permission of ARHU-English Department.

ENGL431 American Literature: Revolution to Civil War (3 Credits)
An examination of nationalism, sentimentalism, and romanticism, with writings focusing on such topics as slavery and democracy during the 1770s to 1860s. Authors typically include Ralph Waldo Emerson, Margaret Fuller, Emily Dickinson, Walt Whitman, Frederick Douglass, Harriet Beecher Stowe, Edgar Allan Poe, Nathaniel Hawthorne, and Herman Melville.
Prerequisite: Two English courses beyond Fundamental Studies; or permission of ARHU-English Department.

ENGL432 American Literature: 1865 to 1914, Realism and Naturalism (3 Credits)
Reconstruction, Realism, Naturalism. Representative writers such as Dickinson, James, Dreiser.
Prerequisite: Two English courses beyond Fundamental Studies; or permission of ARHU-English Department.

ENGL433 American Literature: 1914 to the Present, the Modern Period (3 Credits)
Modernism, Postmodernism. Writers such as Stevens, Stein, Ellison.
Prerequisite: Two English courses beyond Fundamental Studies; or permission of ARHU-English Department.

ENGL435 American Poetry: Beginning to the Present (3 Credits)
Selections of American poetry, from Bradstreet to contemporary free verse. Authors such as Whitman, Dickinson, Bishop, Hughes, Rich, and Frost.
Prerequisite: Two English courses beyond Fundamental Studies; or permission of ARHU-English Department.

ENGL437 Contemporary American Literature (3 Credits)
Prose, poetry, drama of living American writers. Current cultural and social issues.
Prerequisite: Two English courses beyond Fundamental Studies; or permission of ARHU-English Department.

ENGL438 Selected Topics in Media Studies (3 Credits)
Advanced study of a topic pertinent to how the material production, technologies, and cultural practices of diverse types of media shape meaning.
Prerequisite: Two English courses beyond Fundamental Studies; or permission of ARHU-English department.
Recommended: At least one prior course in Media Studies.
Repeatable to: 9 credits if content differs.

ENGL439 Spotlight on Major Writers (3 Credits)
An intensive study of a single writer, or a handful of writers, to understand the shifts in the writer's craft and cultural influence, both past and present.
Prerequisite: Two English courses beyond Fundamental Studies; or permission of ARHU-English Department.
Repeatable to: 9 credits if content differs.

ENGL440 The Novel in America to 1914 (3 Credits)
Survey of the American novel to World War I. Cultural and philosophical contexts; technical developments in the genre. Authors such as Melville, Wells Brown, James, Sedgwick, Chopin.
Prerequisite: Two English courses beyond Fundamental Studies; or permission of ARHU-English Department.

ENGL444 Feminist Critical Theory (3 Credits)
Issues in contemporary feminist thought that have particular relevance to textual studies, such as theories of language, literature, culture, interpretation, and identity.
Prerequisite: WMST200, WGSS200, WMST250, WGSS250, or ENGL250.
Cross-listed with: WGSS444.
Credit Only Granted for: ENGL444, WMST444 or WGSS444.
Formerly: WMST444.

ENGL446 Post-Modern British and American Poetry (3 Credits)
British and American poets from the 1930s to the present. Such poets as Auden, Williams, Plath, Brooks, Lowell, Wolcott, Ted Hughes, Bishop, Larkin, Jarrell, and Berryman.
Prerequisite: Two English courses beyond Fundamental Studies; or permission of ARHU-English Department.

ENGL448 Literature by Women of Color (3 Credits)
Literature by women of color in the United States, Britain, and in colonial and post-colonial countries.
Prerequisite: Must complete two English courses in literature; or permission of the Harriet Tubman Department of Women, Gender, and Sexuality Studies.
Cross-listed with: WGSS448.
Repeatable to: 9 credits if content differs.
Formerly: WMST448.

ENGL449 Selected Topics in U.S. Latinx Literature (3 Credits)
Advanced study of selected works by U.S. Latinx writers.
Prerequisite: Two English courses beyond Fundamental Studies; or permission of ARHU-English Department.
Repeatable to: 9 credits if content differs.

ENGL452 Restoration and 18th-Century British Drama (3 Credits)
Explore Restoration and 18th-century British drama, with attention to the history of gender, sexuality, capitalism, empire, philosophy, and race. Learn about tragedy, comedy, farce, parody, and burlesque, as well as dramatic and verbal wit.
Prerequisite: Two English courses beyond Fundamental Studies; or permission of ARHU-English Department.

ENGL453 Critical Theory in English Studies (3 Credits)
Examines our assumptions about literature, language, media, and culture by exploring how people have theorized key concepts and relations like language, materiality, meaning, representation, identity, and power. We will focus both on learning the history, arguments, and vocabularies of these theories and on evaluating their usefulness for helping us to understand the many kinds of texts (visual, aural, etc.) we study in English. Theoretical thinking will aid us in analyzing the forms texts take; the ideas texts record, challenge, or reinvent; and how texts make us think or feel about ourselves, others, and the world in which we live.
Prerequisite: Two English courses beyond Fundamental Studies; or permission of ARHU-English Department.

ENGL454 Modern Drama (3 Credits)
The history of modern British drama, from its roots in Chekhov and Ibsen, through the modernisms of Samuel Beckett and Bertolt Brecht, through the Angry Young Men of the 1950s, and right up to the present. Most plays will be from the last 40 years, by writers such as David Hare, Tom Stoppard, Lucy Kirkwood, Caryl Churchill, Roy Williams, Lucy Prebble, Alan Bennett, Brian Friel, Terrence Rattigan, Kwame Kwei-Armah, Sarah Kane, and Alice Birch. We will also look at how class, money, immigration, and the end of the Empire changed British plays over time. And we will consider modern theater architecture and production design as well as the directing instincts of, for instance, Peter Brook, Katie Mitchell, Marianne Elliott, and Nicholas Hytner.
Prerequisite: Two English courses beyond Fundamental Studies; or permission of ARHU-English Department.

ENGL455 The 18th-Century British Novel (3 Credits)
Explore the beginnings of the novel in the late seventeenth and eighteenth centuries. Whether set in exotic locales, rural English homes, or the metropolis of London, novels represented reputedly "ordinary" people--often adolescents--and their daily lives. But what constituted a novel and how it influenced readers was debated throughout the century, and even its name ("novel," "romance," "history," "moral tale") was fluid. The novels we will consider are experimental, adventurous, and metafictional, and they will provoke us to evaluate what we expect of the genre, how it functions, and its aesthetic and cultural stakes. Authors may include Aphra Behn, Daniel Defoe, Eliza Haywood, Samuel Richardson, Henry Fielding, Laurence Sterne, Frances Burney, and Sarah Scott.
Prerequisite: Two English courses beyond Fundamental Studies; or permission of ARHU-English Department.

ENGL457 The Modern Novel (3 Credits)
Explore the remarkable development and transformation of the novel in the twentieth century. Learn about the development of the novel through realism, modernism, and postmodernism, from the transformations made by major modernists like Joseph Conrad, James Joyce, Virginia Woolf, Jean Toomer, William Faulkner, and Katherine Ann Porter to playful, unusual and fascinating postmodern and contemporary fiction by Ralph Ellison, Kathy Acker, Salman Rushdie, Toni Morrison, and others.
Prerequisite: Two English courses beyond Fundamental Studies; or permission of ARHU-English Department.

ENGL458 Literature by Women After 1800 (3 Credits)
Selected writings by women after 1800.
Prerequisite: Must have completed two English courses in literature; or permission of Harriet Tubman Department of Women, Gender, and Sexuality Studies.
Cross-listed with: WGSS458.
Repeatable to: 9 credits if content differs.
Formerly: WMST458.

ENGL459 Selected Topics in LGBTQ+ Literatures and Media (3 Credits)
Advanced study of a topic pertinent to literary and cultural expressions of LGBTQ+ identities, positionalities, and analytics through an exploration of literature, art, and/or media.
Prerequisite: Two English courses beyond Fundamental Studies; or permission of ARHU-English Department.
Repeatable to: 9 credits if content differs.

ENGL460 Archival Research Methods in English Studies (3 Credits)
Introduces approaches for doing archival research in English studies, exploring how researchers develop their scope and practices of study and how they access and use archival materials electronically and on site to further their research questions. Investigates a historical period, genre, or theme through the lens of manuscripts, ephemera, and other artifacts. Case studies vary by semester.
Prerequisite: Two English courses beyond the Fundamental Studies courses; or permission of ARHU-English Department.

ENGL461 Researching Literacy and Language (3 Credits)
Gain practical research experience as you learn to do qualitative research in literacy, writing, and language studies. Study reading, writing, and composing in a variety of contexts (for example, social media and other digital spaces, classrooms, writing centers, churches, workplaces or other community sites). Learn to design and conduct ethical, responsible research studies. Learn to collect data through methods such as interview, observation, and survey and to analyze that data through a variety of methods. Finally, learn to present your research through genres such as reports, posters, and/or presentations.
Prerequisite: Students must have satisfied Fundamental Studies Academic Writing requirement.
Credit Only Granted for: ENGL488R or ENGL461.
Formerly: ENGL488R.

ENGL462 Folksong and Ballad (3 Credits)
Explore America's diverse folksong heritage and its impact on world culture. Learn about such regional, ethnic, and popular music forms as ballad, country, bluegrass, blues, rock, gospel, soul, rap, and zydeco within their specific cultural contexts and as commercial products commodified by a voracious music industry. While we will consider the European and African roots of many of these musical traditions, our focus will be on American contributions in the twentieth century. Reading and listening will focus on genres such as blues or bluegrass; particular artists such as Bessie Smith, Robert Johnson, Bill Monroe, and Louis Jordan; and major figures in the recording industry or fieldworker collectors such as Alan Lomax.

ENGL463 Narrative Analysis Methods in English Studies (3 Credits)
Approaches to literary narrative analysis. Explores narrative theory as a research method for studying the fundamental categories of literary narrative--such as the narrator, character, plot, closure, and frames, as well as the nature of fictionality and the role of the reader--and for interpreting their deployment in individual literary works. We will use this method to examine particularly unusual and even radical fiction, so we can understand the meaning-making work accomplished by narrative form.
Prerequisite: Two English courses beyond Fundamental Studies; or permission of ARHU-English department.

ENGL466 Arthurian Legend (3 Credits)
Development of Arthurian legend in English and continental literature from Middle Ages to twentieth century. All readings in modern English.
Prerequisite: Two English courses beyond Fundamental Studies; or permission of ARHU-English Department.

ENGL467 Creative Approaches to Digital Textuality (3 Credits)
Examines electronic literature and other aspects of the literary world online with a focus on experimental writing with computers. Topics may include digital fiction and storytelling, bots, book hacking, flash fiction, narrative in games, and artificial-intelligence-generated fiction, poetry, and art. No programming experience required.
Prerequisite: One English course beyond Fundamental Studies; or permission of ARHU-English department.

ENGL468 Selected Topics in Film Studies (3-9 Credits)
Advanced studies in various periods and genres of film.
Prerequisite: ENGL245, FILM245, CINE245, FILM283, or SLLC283; or permission of ARHU-English department.
Recommended: ENGL329, CMLT280, and ENGL245.
Repeatable to: 9 credits if content differs.

ENGL469 The Craft of Literature: Creative Form and Theory (3 Credits)
Examines various forms of poetry and/or fiction, emphasizing the practice of making literary art and the aesthetic and theoretical approaches that define it. Students will practice the elements of literary craft, producing and experimenting with a wide range of forms and conventions in poetry and/or fiction. They will also produce critical work that articulates and contextualizes theoretical approaches to the making of literary art.
Prerequisite: 2 ENGL courses in literature or creative writing; and have completed a 200-level creative writing workshop in ENGL. Or permission of ARHU-English department.
Repeatable to: 9 credits if content differs.

ENGL470 African-American Literature: From Slavery to Freedom (3 Credits)
Examines African-American literature from its beginnings to the early twentieth century, including genres ranging from slave narratives, pamphlets, essays, and oratory, to poetry and fiction. Our emphasis is on the interaction between literature and literary forms, on the one hand, and historical and political developments in the push toward emancipation, on the other.
Prerequisite: Two English courses beyond Fundamental Studies; or permission of ARHU-English Department.

ENGL471 African-American Literature: 1910-1945 (3 Credits)
Emergence of modernism in African-American writing including debates over the definition of unique African-American aesthetics, with emphasis on conditions surrounding the production of African-American literatures.
Prerequisite: Two English courses beyond Fundamental Studies; or permission of ARHU-English Department.

ENGL472 African-American Literature: 1945 to Present (3 Credits)
Transformation of African-American literatures into modern and postmodern forms. Influenced by World War II and the Civil Rights and Black Power movements, this literature is characterized by conscious attempts to reconnect literary and folk forms, the emergence of women writers, and highly experimental fiction.
Prerequisite: Two English courses beyond Fundamental Studies; or permission of ARHU-English Department.

ENGL475 Postmodern Literature (3 Credits)
Explore the origins and ongoing development of postmodern literature. Learn about the "postmodern condition," such as the collapse of identity, the erasure of cultural and aesthetic boundaries, and the dissolution of life into textuality. Explore art that has come in the wake of postmodernism and has attempted to move beyond it. Readings might include novels and other genres in varied media by Samuel Beckett, Art Spiegelman, Julian Barnes, Colson Whitehead, Ruth Ozeki, Zadie Smith, and others.
Prerequisite: Two English courses beyond Fundamental Studies; or permission of ARHU-English Department.

ENGL477 BookLab (3 Credits)
Historical, imaginative, and experiential introduction to different elements of books and bookmaking, including letterpress printing with traditional lead and wood (movable) type, different techniques for bindings, 3D printing, zines, making altered and treated books, and so on. Class-time will be a mix of discussion and hands-on activity. The course will culminate in each student designing and creating their own book object, which might take the form of an artist's book, chapbook, zine, an altered or treated book, or something else entirely. Taught with the resources and facilities available in the English department's BookLab.
Prerequisite: Two English courses beyond Fundamental Studies; or permission of ARHU-English Department.
Credit Only Granted for: ENGL428M, ENGL438P, ENGL479P, or ENGL477.
Formerly: ENGL428M, ENGL438P, ENGL479P.

ENGL478 Selected Topics in Literature before 1800 (3 Credits)
Advanced study of key topics in literary works from earlier historical periods.
Prerequisite: Two English courses beyond Fundamental Studies; or permission of ARHU-English Department.
Repeatable to: 9 credits if content differs.

ENGL479 Selected Topics in Literature after 1800 (3 Credits)
Advanced study of key topics in literary works from later historical periods.
Prerequisite: Two English courses beyond Fundamental Studies; or permission of ARHU-English Department.
Repeatable to: 9 credits if content differs.

ENGL482 History of the English Language (3 Credits)
Examines the origins and development of the English language.
Prerequisite: ENGL280, LING200, or HESP120; or permission of ARHU-English department.

ENGL483 American English(es) (3 Credits)
Examines the diversity of dialects, registers, and jargons of English found in the United States, as well as their origins, structures, and functions in society.
Prerequisite: LING200, ENGL280, or HESP120; or permission of ARHU-English department.

ENGL484 Style and Grammar in Written English (3 Credits)
The linguistic analysis of written texts. Examines grammatical and discursive constructions above the level of the sentence and their functions in literary and non-literary texts. We will study narrative structure, authorial voice, genre, register, stance, viewpoint, empathy, surprise, and humor in language.
Prerequisite: Students must have satisfied Fundamental Studies Academic Writing requirement.

ENGL487 Principles and Practices of Rhetoric (3 Credits)
A seminar examining foundational concepts and approaches in the theory and practice of rhetoric in civic, professional, academic, and interpersonal settings; focusing on key issues in persuasion, argumentation, and eloquence in historical and contemporary contexts.
Prerequisite: Students must have satisfied Fundamental Studies Academic Writing requirement.

ENGL488 Topics in Advanced Writing (3 Credits)
Different genres of technical and professional writing including proposal writing, computer documentation, technical report writing, instruction manuals, etc. Students will analyze models of a genre, produce their own versions, test, edit and revise them.
Prerequisite: Students must have satisfied Fundamental Studies Academic Writing requirement.
Repeatable to: 9 credits if content differs.

ENGL489 Special Topics in Language and Rhetoric (3 Credits)
Special topics in language and rhetoric, such as discourse analysis, semantics, or cognitive linguistics; comparative rhetoric and rhetorical theory, digital rhetorics, women's and minority rhetorics, or the history of rhetoric.
Prerequisite: Students must have satisfied Fundamental Studies Academic Writing requirement.
Repeatable to: 9 credits if content differs.

ENGL491 Digital Rhetoric (3 Credits)
Examines the social significance of the ways digital texts are composed and circulated. Explores why it matters how the web is written and who does the writing, understanding the Internet as rhetorical from its content and communities to the code, protocols, and policies that control digital distribution. Includes active experimentation with digital tools so students can expand their theoretical understanding through critical making.
Prerequisite: Students must have satisfied the Fundamental Studies Academic Writing requirement.
Credit Only Granted for: ENGL489J, or ENGL491.
Formerly: ENGL489J.

ENGL492 Graphic Design and Rhetoric (3 Credits)
An exploration of the visual dimensions of texts and the skills involved in designing them well. Considers graphic design theory and history from a rhetorical perspective, working to understand and practice the use of symbol systems to express, inform, and advocate. Includes direct experimentation with the principles and techniques of graphic design.
Prerequisite: Students must have satisfied Fundamental Studies Academic Writing requirement.

ENGL493 Writing Genres as Social Action (3 Credits)
A rhetorical genre studies approach to understanding the work that texts do in the world. Examines issues of identity, power, and medium as they relate to writing in various contexts. Students analyze the texts, context(s), and social significance of a public, professional, digital, and/or advanced academic genre and produce writing that meets, modifies, and subverts expectations.
Recommended: Satisfactory completion of the professional writing requirement (FSPW).
Restriction: Must have earned a minimum of 60 credits.

ENGL494 Editing and Document Design (3 Credits)
Principles of general editing for clarity, precision and correctness. Applications of the conventions of grammar, spelling, punctuation and usage, and organization for logic and accuracy. Working knowledge of the professional vocabulary of editing applied throughout the course.
Prerequisite: One course in Fundamental Studies Professional Writing; or permission of ARHU-English Department.

ENGL495 Independent Study in Honors (1-3 Credits)
Completion and presentation of the senior honors project.
Prerequisite: ENGL373 and ENGL370.
Restriction: Must be in English Language and Literature program; and candidacy for honors in English.

ENGL497 English at Work (3 Credits)
Examines how English majors put their academic knowledge and skills to work in professional workplaces after graduation. Students learn strategies to research careers, and they shadow a person in a career of interest for a day. Students learn to compose different professional genres to write and speak about and for professional development and advancement, including inquiry letters, technical descriptions, professional portfolios, and elevator pitches. Students will critically examine the learning they have done in their undergraduate coursework and compose a vision for bringing that learning to life in their future work.
Prerequisite: ENGL301; and an ENGL course at the 300-level or higher.
Restriction: Must have earned a minimum of 60 credits.

ENGL498 Advanced Fiction Workshop (3 Credits)
An advanced class in the making of fiction. Intensive discussion of students' own fiction. Readings include both fiction and essays about fiction by practicing writers. Writing short critical papers, responding to works of fiction, and to colleagues' fiction, in-class writing exercises, intensive reading, and thinking about literature, in equal parts, and attendance at readings.
Prerequisite: ENGL352; or permission of ARHU-English department.
Repeatable to: 9 credits if content differs.

ENGL499 Advanced Poetry Workshop (3 Credits)
An advanced class in the making of poetry. Intensive discussion of students' own poems. Readings include both poetry and essays about poetry by practicing poets. Writing short critical prose pieces, responding critically to colleagues' poems, in-class and outside writing exercises, and attendance at poetry readings.
Prerequisite: ENGL353; or permission of ARHU-English department.
Repeatable to: 9 credits.

ENGX - English Education Abroad

ENGX200 Writing From Research (3 Credits)
Prepares students to plan, research, and write academic-level research papers autonomously. Students are guided through all writing stages, from preparing an articulated research proposal, to collecting sources and arranging them in an annotated bibliography, to outlining, drafting, and, finally, completing the paper in accordance with current MLA guidelines.
Additional Information: This course is offered as part of the Maryland-in-Rome study abroad program. Students must apply for this program through Education Abroad: More information at ter.ps/UMRome. Education Abroad processes registrations for this course on behalf of students.

ENGX202 Fiction: Genre, Techniques, and Structure (3 Credits)
Designed to help students acquire the skills for reading, appreciating, writing, and critically analyzing fiction. This course intends to introduce the students to basic concepts about literary technique, elements of fiction, and innovation while honing their critical thinking skills.
Additional Information: This course is offered as part of the Maryland-in-Rome study abroad program. Students must apply for this program through Education Abroad: More information at ter.ps/UMRome. Education Abroad processes registrations for this course on behalf of students.

ENGX204 Writing Rome (3 Credits)
Explores the city of Rome through writing. On-site classes provide an interdisciplinary, studio-art approach to the generation of written work. Through the studied practice of descriptive writing and the examination of setting as a vital literary component, students will create their own textual map of the Eternal City.
Additional Information: This course is offered as part of the Maryland-in-Rome study abroad program. Students must apply for this program through Education Abroad: More information at ter.ps/UMRome. Education Abroad processes registrations for this course on behalf of students.

ENGX205 Creative Writing: Prose Fiction (3 Credits)
Introduces students to writing prose fiction through practice-based workshops and seminars. Students will explore the methodologies of writing fiction from a writer's perspective, and focus on form, structure, and narrative technique.
Additional Information: This course is offered as part of the Arts & Humanities-in-London study abroad program. Students must apply for this program through Education Abroad: More information at https://globalmaryland.umd.edu/offices/education-abroad/program/11854. Education Abroad processes registrations for this course on behalf of students.

ENGX206 Travel Writing (3 Credits)
Explores the genre of travel writing through the analysis of a wide range of works, including articles about food, art, nature, and culture. Takes students outside of the classroom and into the city of Florence and considers the principles of concise, clear, and entertaining prose that make travel writing worth reading.
Additional Information: This course is offered as part of the Maryland-in-Florence study abroad program. Students must apply for this program through Education Abroad: More information at ter.ps/UMFlorence. Education Abroad processes registrations for this course on behalf of students.

ENGX207 Creative Writing (3 Credits)
Examines and explores the different genres of creative writing through the study of prose and poetry by British, American, French and Russian authors from the Romantics to the present. Introduces the various elements of creative writing including plot, point of view, character, dialogue, voice and theme.
Additional Information: This course is offered as part of the Maryland-in-Florence study abroad program. Students must apply for this program through Education Abroad: More information at ter.ps/UMFlorence. Education Abroad processes registrations for this course on behalf of students.

ENGX210 Writing Italian Food (3 Credits)
Explores the history and customs of food, olive oil, and wine in Perugia and the surrounding region through food writing and visits to local restaurants, cheese makers, vineyards, and olive groves. Examines combinations of historical moment and type of food, such as the question of pizza, the origin of the aperitivo, and the arrival of coffee in Italy, while focusing on what makes a compelling article, techniques and skills related to food writing, and approaches to publication in online and print platforms.
Additional Information: This course is offered as part of the Maryland-in-Perugia study abroad program. Students must apply for this program through Education Abroad: More information at https://globalmaryland.umd.edu/offices/education-abroad/program/11294. Education Abroad processes registrations for this course on behalf of students.

ENGX211 Introduction to Creative Writing: Travel Writing (3 Credits)
Introduces students to this rich inheritance of travel writing, while guiding them through their own writing process, from scribbling down notes to polishing their final submission. Along the way, students will learn to identify the key elements of compelling narrative nonfiction (such as voice, narrative structure, setting and the use of figurative language) and begin to develop these qualities in their own writing. Since travel writing must be factual as well as creative, students will also learn how to add nuance to their writing through research. Writing workshops will be a place to test out ideas and receive feedback from peers and the instructor.
Additional Information: This course is offered as part of the Maryland-in-Florence study abroad program. Students must apply for this program through Education Abroad: More information at ter.ps/UMFlorence. Education Abroad processes registrations for this course on behalf of students.

ENGX212 What's So Funny? (3 Credits)
Investigates how political and religious satire can reflect cultural norms, open new perspectives, challenge common sense, offend authorities, stigmatize groups, and empower others. Students analyze a number of historical and contemporary works of satire and produce a number of works themselves in the form of cartoons, satirical news articles, and memes. Combines a historical and theoretical examination of satire with a practical understanding of how to use satirical means to evoke laughter, incite critical thought, or provoke indignation in an audience.
Additional Information: This course is offered as part of the Maryland-in-Copenhagen study abroad program. Students must apply for this program through Education Abroad: More information at ter.ps/UMCopenhagen. Education Abroad processes registrations for this course on behalf of students.

ENGX213 Writing the Mediterranean (3 Credits)
Aims to introduce students to Mediterranean landscapes and cityscapes, and serves as a map for possible journeys, inspiring works--poetry, fiction and nonfiction--by students. As a starting historical point, the course explores the idea of Mediterraneaness, and its contemporary politics, society, culture, identities and languages. By reading the most exciting and best-known literary works inspired by major Mediterranean cities (Marseilles, Venice, Dubrovnik, Alexandria, Thessaloniki, Istanbul etc.) students will attain an awareness of the richness and complexity of the region, while exploring their voice and vision, and becoming active and engaged writers.
Additional Information: This course is offered as part of the Maryland-in-Rome study abroad program. Students must apply for this program through Education Abroad: More information at ter.ps/UMRome. Education Abroad processes registrations for this course on behalf of students.

ENGX300 The Image of Barcelona in Literature (3 Credits)
After the Olympic Games of 1992, Barcelona became an international tourist destination; but a short visit cannot account for the cultural complexities of the Catalan capital. In order to know any city, to "dwell" in it, we need to become familiar with its oral history, paintings, architecture, sculpture, and literary texts.
Additional Information: This course is offered as part of the Maryland-in-Barcelona study abroad program. Students must apply for this program through Education Abroad: More information at ter.ps/UMBarcelona. Education Abroad processes registrations for this course on behalf of students.

ENGX302 From Literature to Social Media: Reading and Writing Italian Food (3 Credits)
Focuses on one important aspect (present in both fiction and nonfiction writing): the expression and description of sensory experiences through words. Examining literature as well as nonfictional food writings, students will discover that the art of writing about food and drink involves not only an interest in the gustatory experience, but also an ability to translate sensory experiences into words.
Formerly: ENGL379I.
Additional Information: This course is offered as part of the Maryland-in-Perugia study abroad program. Umbria Institute Course Code: ENG325. More information at ter.ps/UMPerugia.

ENGX303 Italian Tales and Stories: Creative Writing Through Literary Models (3 Credits)
Explores the process of transforming sensory impressions, individual feelings, personal experiences, and factual information into engaging and effective works of creative fiction and non-fiction. Students will read from a cross-section of Italian authors dealing with a wide range of topics and issues. They will also generate their own writing through a series of exercises designed to help the writer tap into new levels of awareness and creative energy. Students will also be involved in a series of 'literary walks' aimed at enhancing their ability to gather information from the exploration of Italian natural and urban landscapes.
Formerly: ENGL379W.
Additional Information: This course is offered as part of the Maryland-in-Perugia study abroad program. Umbria Institute Course Code: ENG 340. More information at ter.ps/UMPerugia.

ENGX305 Scandinavian Crime Fiction (3 Credits)
In Scandinavian crime fiction, the most fantastic murders take place, families fall apart, their dark secrets are exposed, and the validity of the Scandinavian countries' welfare system is questioned - all of this described in a distinctly Scandinavian tone and style.
Additional Information: This course is offered as part of the Maryland-in-Stockholm study abroad program. Students must apply for this program through Education Abroad: More information at ter.ps/UMStockholm. Education Abroad processes registrations for this course on behalf of students.

ENGX306 Creative Writing (3 Credits)
Explores the creative process, giving students concrete ways to enhance their creative thought and writing. Through writing assignments and numerous inventive classroom exercises, students learn how to write more interesting characters, fascinating plots and colorful stories.
Credit Only Granted for: ENGX203 or ENGX306.
Formerly: ENGX203.
Additional Information: This course is offered as part of the Maryland-in-Rome study abroad program. Students must apply for this program through Education Abroad: More information at ter.ps/UMRome. Education Abroad processes registrations for this course on behalf of students.

ENGX307 Advanced Video Production and Post-Production (3 Credits)
Brings students' fluency of cinematic language to a more advanced stage by expanding upon and synthesizing the shooting and editing techniques. The class introduces the conceptual and technical framework necessary to shoot and edit dual-system sound films, block and shoot dialogue scenes, perform dramatic analysis to scripts, and apply that analysis to a more sophisticated use of camera work and complex editing strategies.
Additional Information: This course is offered as part of the Maryland-in-Romestudy abroad program. Students must apply for this program through Education Abroad: More information at ter.ps/UMRome. Education Abroad processes registrations for this course on behalf of students.

ENGX310 Mafia, Murder, and Mystery: Crime in Italian and American Cinema (3 Credits)
Studies how mafia and organized crime are presented in Italian and American cinematic texts. The course will examine the different expressions of the crime film genre, which dates back to the beginnings of filmmaking, focusing on the technical, visual, and aesthetic aspects of crime films.
Cross-listed with: CINX310.
Additional Information: This course is offered as part of the Maryland-in-Perugia study abroad program. Students must apply for this program through Education Abroad: More information at ter.ps/UMPerugia. Education Abroad processes registrations for this course on behalf of students.

ENGX311 European Storytelling: From Homer to Harry Potter (3 Credits)
An introduction to European oral tradition, as expressed in European myth-cycles, legends and fairytales, from the earliest known sources up to and including modern uses of this tradition.
Additional Information: This course is offered as part of the Maryland-in-Copenhagen study abroad program. Students must apply for this program through Education Abroad: More information at ter.ps/UMCopenhagen. Education Abroad processes registrations for this course on behalf of students.

ENGX312 Live, Love or Die in Italy: Major Italian Writers in English Translation II (3 Credits)
As a sequel to Major Italian Writers I, this course explores modern and contemporary Italian literature through the reading, analysis, and discussion of late eighteenth, nineteenth, and twentieth century Italian novels in translation, by authors such as Foscolo, Verga, Camillo Boito, D'Annunzio, Svevo, Carlo Levi, and Morante. Students are encouraged to compare and contrast authors and books and to identify and discuss major literary periods and genres (such as Romanticism, Realism, Modernism and Neo-realism).
Additional Information: This course is offered as part of the Maryland-in-Rome study abroad program. Students must apply for this program through Education Abroad: More information at ter.ps/UMRome. Education Abroad processes registrations for this course on behalf of students.

ENGX313 Creative Non-Fiction Writing (3 Credits)
Nonfiction is a genre that has grown more diverse and creative than ever, embracing all styles from serious to whimsical and encompassing every topic imaginable. This course will focus on the creative process and the generation of several different forms of writing within the nonfiction genre, including the personal essay, the memoir, biography, and the journalistic or magazine profile. Through the examination of professional examples of creative nonfiction, discussion, and critiques, students will become acquainted with the techniques and tools used to build a strong portfolio of literary and journalistic pieces.
Additional Information: This course is offered as part of the Maryland-in-Rome study abroad program. Students must apply for this program through Education Abroad: More information at ter.ps/UMRome. Education Abroad processes registrations for this course on behalf of students.

ENGX314 The Mafia in Italian Society, Literature and Film (3 Credits)
Explores representations of the Italian Mafia in literature and cinema, with reference also to the Italian-American context. Students will be introduced to the history of the mafia, starting from its beginnings in Sicily, and follow its historical and geographical evolution within, and also outside, Italy. The course will make reference to Italian literary texts as well as Italian and Italian-American cinematic representations of the phenomenon.
Additional Information: This course is offered as part of the Maryland-in-Rome study abroad program. Students must apply for this program through Education Abroad: More information at ter.ps/UMRome. Education Abroad processes registrations for this course on behalf of students.

ENGX315 Travel Writing Workshop (3 Credits)
Students will learn the fundamentals of travel and destination-based writing, with the opportunity to practice the craft in various formats, from personal narratives to feature writing to service journalism. They will develop the necessary skills to write compellingly and sensitively about travel, avoiding cliches and cultural faux pas. Occasional guest lecturers working in the field will shed further light on these topics. Interested students will have the chance, with guidance from their instructor, to pitch or to send finished pieces on spec to local or special Italy-interest publications.
Credit Only Granted for: ENGL369M or ENGX315.
Additional Information: This course is offered as part of the Maryland-in-Florence study abroad program. Students must apply for this program through Education Abroad: More information at ter.ps/UMFlorence. Education Abroad processes registrations for this course on behalf of students.

ENGX316 Rome on Screen and in Print (3 Credits)
Focuses on the city of Rome and explores past and present representations of the eternal city in Italian literature and film. Focuses on late 19th- and 20th-century Rome from the point of view of selected works of Italian literature and cinema in which the city plays a prominent role. Students identify and analyze the connections between texts, ideas, or cultural artifacts and the human experience and/or perception of the world.
Additional Information: This course is offered as part of the Maryland-in-Rome study abroad program. Students must apply for this program through Education Abroad: More information at ter.ps/UMRome. Education Abroad processes registrations for this course on behalf of students.

ENGX321 A Sense of Place in European Literature (3 Credits)
Explores and identifies the interrelation between place and text. Discovers comparative perspectives on European literature through in-depth analysis and close readings of texts written by modern and classical European writers.
Additional Information: This course is offered as part of the Maryland-in-Copenhagen study abroad program. Students must apply for this program through Education Abroad: More information at ter.ps/UMCopenhagen. Education Abroad processes registrations for this course on behalf of students.

ENGX400 Fashion, Media and Communication (3 Credits)
Fashion Writing is an extremely important aspect of cultural and creative nonfiction prose. With the rise of internet and mass journalism worldwide, the fashion and accessories industry has become increasingly focused on getting across the messages to audiences of all ages and backgrounds.
Additional Information: This course is offered as part of the Maryland-in-Florence study abroad program. Students must apply for this program through Education Abroad: More information at ter.ps/UMFlorence. Education Abroad processes registrations for this course on behalf of students.

ENGX401 Shakespeare's Italian Plays (3 Credits)
The intensive study of five or six of Shakespeare's comedies and tragedies set in Italy, ancient and early modern, with attention to English attitudes toward Italy and Shakespeare's use of Italy, the nature of comedy and tragedy, and the shape of Shakespeare's career.
Additional Information: This course is offered as part of the Maryland-in-Rome study abroad program. American University of Rome Course code: ENG 301 / ENG 309. More information at ter.ps/UMRome.

ENGX404 Travel Writing (3 Credits)
The world is full of fascinating people and places - and stories waiting to be told. Travel writers capture these stories and pass them on to their readers. Good travel writers make us care. In this class, you will learn how to identify relevant stories, how to gather material and how to release all of this in well-written pieces. Our main focus is narrative journalism - the kind of stories you would normally see as features in travel magazines.
Additional Information: This course is offered as part of the Maryland-in-Copenhagen study abroad program. More information at ter.ps/UMCopenhagen.

ENGX405 Hans Christian Andersen and the Danish Golden Age (3 Credits)
Hans Christian Andersen (1805-1875) is internationally known as the writer of fairy tales. Children all over the world know The Ugly Duckling, The Emperor's New Clothes, The Little Mermaid, The Princess and the Pea and other tales. But Andersen also wrote plays, novels, poems, travelogues and songs. This course will be a study of approximately 30 fairy tales by Hans Christian Andersen (1805-75) as well as extracts from his travelogues, poems, diaries and his autobiography, The Fairy Tale of My Life.
Additional Information: This course is offered as part of the Maryland-in-Copenhagen study abroad program. More information at ter.ps/UMCopenhagen.

ENGX406 The Literature of War - Europe and WWI (3 Credits)
Examines the various literary responses to war and the ways in which artists and writers have negotiated power, violence, and resistance within the context of military conflict.
Additional Information: This course is offered as part of the Maryland-in-Rome study abroad program. Students must apply for this program through Education Abroad: More information at ter.ps/UMRome. Education Abroad processes registrations for this course on behalf of students.

ENGX407 Italian Women Writers (3 Credits)
This course presents an overview of women's fiction in Italy from the turn-of-the-century context, with writers such as Neera and Sibilla Aleramo, to the present day, with Elena Ferrante and Dacia Maraini. The course will examine women's changing role within Italian society and issues such as sexual violence, motherhood, the search for self-determination and autonomy and paths to political awareness.
Additional Information: This course is offered as part of the Maryland-in-Rome study abroad program. Students must apply for this program through Education Abroad: More information at ter.ps/UMRome. Education Abroad processes registrations for this course on behalf of students.

ENGX410 Literary Editing and Publishing (3 Credits)
Designed to be an overview in literary editing for publication and will explore in-depth the publishing industry--the history, current trends, future possibilities--for both writers and editors. Students will develop many skills related to the publishing industry, such as copyediting, revision, query letters, literary critique and analysis, and submitting and reviewing work.
Additional Information: This course is offered as part of the Maryland-in-Rome study abroad program. Students must apply for this program through Education Abroad: More information at ter.ps/UMRome. Education Abroad processes registrations for this course on behalf of students.

ENGX411 Major American Authors: Hemingway (3 Credits)
Examines the life and expatriate writings of Ernest Hemingway, exploring his themes, style, and narrative technique. We will examine not only issues of style and technique but also how Hemingway's expatriate experience influenced his writing. Our major objective in this class will be to acquaint ourselves with the contributions of Hemingway to American literature through close reading and careful discussion of much of his works.
Additional Information: This course is offered as part of the Maryland-in-Rome study abroad program. Students must apply for this program through Education Abroad: More information at ter.ps/UMRome. Education Abroad processes registrations for this course on behalf of students.

ENGX412 Sense of Place in European Literature (3 Credits)
Explores and identifies the interrelation between place and text. We discover comparative perspectives on European literature through in-depth analysis and close readings of texts written by modern and classical European writers. Our geographic focus is primarily Denmark, Germany, the Baltic region, and Russia. The European Humanities core course includes a total of 18 classes, a core course week with a short study tour to the island of Fano, and a six day long study tour to Berlin, Germany.
Additional Information: This course is offered as part of the Maryland-in-Copenhagen study abroad program. Students must apply for this program through Education Abroad: More information at ter.ps/UMCopenhagen. Education Abroad processes registrations for this course on behalf of students.

ENGX413 Colonial Literatures, Postcolonial Perspectives (3 Credits)
Introduces students to a selection of novels and short fiction written within the context of the European colonization of South Asia, South East Asia, Africa, the Middle East and the Americas. Focuses on non-European authors and the experience of colonialism from a non-European perspective. Explores postcolonial theory and its relevance to the discipline of Comparative Literature.
Additional Information: This course is offered as part of the Arts & Humanities-in-London study abroad program. Students must apply for this program through Education Abroad: More information at https://globalmaryland.umd.edu/offices/education-abroad/program/11854. Education Abroad processes registrations for this course on behalf of students.

ENGX414 Presentations of London in Modern European Literature and Film (3 Credits)
London has been the largest European city for the last two-and-a-half centuries and has played a dominant role in European culture since that time. This course explores the ways in which this idea is presented in examples of literature and film from the late nineteenth century to the present day.
Additional Information: This course is offered as part of the Arts & Humanities-in-London study abroad program. Students must apply for this program through Education Abroad: More information at https://globalmaryland.umd.edu/offices/education-abroad/program/11854. Education Abroad processes registrations for this course on behalf of students.

ENGX415 Terror, Transgression and Astonishment: the Gothic in the Long Nineteenth Century (3 Credits)
Explores why writers seem compelled to write about the gruesome, sordid, creepy, or just terrifying aspects of humanity through analyzing Gothic fiction in the late eighteenth century to the nineteenth century. Students will explore genres such as ghost stories or the supernatural, while also looking at a few texts that are considered "unclassifiably weird," to see how the Gothic and related genres emerge in relation to cultural and social trends.
Additional Information: This course is offered as part of the Arts & Humanities-in-London study abroad program. Students must apply for this program through Education Abroad: More information at https://globalmaryland.umd.edu/offices/education-abroad/program/11854. Education Abroad processes registrations for this course on behalf of students.

ENGX416 James Baldwin and American Civil Rights (3 Credits)
The movement for Civil Rights and Black Power in the US marked a decisive phase in the making of our contemporary world. This course uses the novels, short stories, and autobiographical reportage of James Baldwin as a framework for exploring the Civil Rights movement and Black Power, the relationship of race and sexuality, the "Americanness" of American literature, and Baldwin's own relationship with the Civil Rights movement as an openly homosexual man.
Additional Information: This course is offered as part of the Arts & Humanities-in-London study abroad program. Students must apply for this program through Education Abroad: More information at https://globalmaryland.umd.edu/offices/education-abroad/program/11854. Education Abroad processes registrations for this course on behalf of students.

ENGX417 Time, Narrative and Culture (3 Credits)
Examines how an understanding of narrative informs a wider concept of culture with a focus on strange temporal structures and time-experiments in contemporary fiction and their effect on how we experience time. Students will analyze texts that exhibit a variety of temporal structures including backwards narration, flashforward, trans-historical jumps, and fuzzy temporality, as well as explore philosophical and social theories of time.
Additional Information: This course is offered as part of the Arts & Humanities-in-London study abroad program. Students must apply for this program through Education Abroad: More information at https://globalmaryland.umd.edu/offices/education-abroad/program/11854. Education Abroad processes registrations for this course on behalf of students.

ENGX421 In an Ideal World: Utopias from Plato to the Present (3 Credits)
Delves into the idea of the Utopia as both its own literary genre and as a means of thinking about political ideals and practice. This course will look at the development of the Utopia genre across time, ways in which fiction serves as a way to debate and comment on political practice and how political arguments are portrayed through fictional and metaphorical devices.
Additional Information: This course is offered as part of the Arts & Humanities-in-London study abroad program. Students must apply for this program through Education Abroad: More information at https://globalmaryland.umd.edu/offices/education-abroad/program/11854. Education Abroad processes registrations for this course on behalf of students.

ENGX422 American Money: Novels 1793-1930 (3 Credits)
Explores the great American subject of money from the foundations of the Republic to the Jazz Age. Students will study works of fiction that focus on capital, thrift, production, high finance, self-sufficiency, and fraud, and consider the effects of the recent banking crisis and history and psychology of financial behavior, and of money itself.
Additional Information: This course is offered as part of the Arts & Humanities-in-London study abroad program. Students must apply for this program through Education Abroad: More information at https://globalmaryland.umd.edu/offices/education-abroad/program/11854. Education Abroad processes registrations for this course on behalf of students.

ENGX423 After Postcolonialism (3 Credits)
Explores the limits and boundaries of postcolonial literature. Offers a contemporary focus (including the War on Terror and Islamophobia) and takes into account regions that are not strictly postcolonial (including China and the U.S.) Uses critical theory to extend the idea of the "postcolonial" and study how we conceptualize the present moment.
Additional Information: This course is offered as part of the Arts & Humanities-in-London study abroad program. Students must apply for this program through Education Abroad: More information at https://globalmaryland.umd.edu/offices/education-abroad/program/11854. Education Abroad processes registrations for this course on behalf of students.

ENGX425 How Are We Feeling?: Affect and/in Contemporary Literature and Culture (3 Credits)
Explores how the social, psychological, and philosophical understandings of the way we feel, and represent or evoke feeling, influence how authors use aesthetics, audience, and ethics in relation to affective states such as remorse, boredom, nostalgia, fascination, rebellion, and expectation. This course examines a selection of fiction, poetry, creative nonfiction, life writing, television, and film to understand how cultural texts represent the affective experiences of contemporary life.
Additional Information: This course is offered as part of the Arts & Humanities-in-London study abroad program. Students must apply for this program through Education Abroad: More information at https://globalmaryland.umd.edu/offices/education-abroad/program/11854. Education Abroad processes registrations for this course on behalf of students.

ENGX426 The Politics of Irish Literature, from the Eighteenth to the Twentieth Century (3 Credits)
Irish writing in the English language has re-shaped cultural history through the interventions of great originals such as Yeats, Joyce, and Beckett. This course looks at Irish literature through a political lens through the study of texts by a variety of authors and relates these works to historical contexts such as the Union with Britain, the Famine of the 1840s, the cultural revival at the turn of the twentieth century, the Irish revolution, and the Northern Irish crisis.
Additional Information: This course is offered as part of the Arts & Humanities-in-London study abroad program. Students must apply for this program through Education Abroad: More information at https://globalmaryland.umd.edu/offices/education-abroad/program/11854. Education Abroad processes registrations for this course on behalf of students.

ENGX427 Poetry and Poetics of Resistance (6 Credits)
Provides students with a global viewpoint of poetry and poetics of resistance, tracing similarities and finding differences in the various poetic approaches used by authors who live in nations without a State, exiled writers, and dissident voices within mainstream cultural politics. Students will examine different works on exile, both physical and internal, by poets such as Homi Bhabha, Julia Kristeva, Arjun Appadurai, Salman Rushdie, George Lamming, and Edward Said.
Additional Information: This course is offered as part of the Arts & Humanities-in-London study abroad program. Students must apply for this program through Education Abroad: More information at https://globalmaryland.umd.edu/offices/education-abroad/program/11854. Education Abroad processes registrations for this course on behalf of students. Please note this course spans two semesters (one academic year).

ENGX430 The Crisis of Culture: Literature and Politics 1918-1948 (3 Credits)
Explores the ways in which the writers of the period following the First and Second World Wars engaged with the turbulent politics and dramatically changing social life in Great Britain. Explores the paradigm shift of a post-war Europe as a darker, more complex, and less certain epoch began.
Additional Information: This course is offered as part of the ARHU-in-London study abroad program. Students must apply for this program through Education Abroad: More information at ter.ps/ARHULondon. Education Abroad processes registrations for this course on behalf of students.

ENMA - Engineering, Materials

ENMA150 Materials of Civilization (3 Credits)
The discovery of new materials has shaped history and built civilizations. The utilization, properties and production techniques of materials from the Bronze Age up through modern times and into the future will be traced. These materials are explained by considering their atomic structure, the binding forces between atoms and their arrangement, and how controlling the structure controls the materials properties.

ENMA165 Introduction to Programming with Python (3 Credits)
Introduces concepts of computer programming using Python from the point-of-view of engineers and scientists (as opposed to computer science). Students will learn the fundamentals of writing and implementing code, and exposed to practical aspects of programming as may be relevant to their studies and careers in the materials field. Topics/activities of note include data management and analysis, laboratory-related scripting, simple automation, and introduction to computational materials concepts.
Restriction: Permission of ENGR-Materials Science & Engineering department.
Credit Only Granted for: ENEE140 or ENMA165.

ENMA180 Materials Science and Engineering: The Field and the Future (1 Credit)
Overview of the profession and the components of the Materials Science and Engineering program. Students will become familiar with the departmental faculty, areas of specialization within MSE, professional society student chapter, research opportunities and other resources available to students.
Restriction: Permission of ENGR-Materials Science Engineering department.

ENMA201 Bigger, Faster, Better: The Quest for Absolute Technology (3 Credits)
Can one prevent the transformation of technology from a friend to foe? Constant technological change characterizes our current lives and future, but ambivalence marks our relationships with technology. Students will be introduced to concepts necessary to understand scientific, engineering and societal driving forces of selected technological transformations, and the conflicts inherent in introduction of new technologies. We investigate approaches to judicious implementation of technology to prevent it changing from friend to foe.
Credit Only Granted for: ENMA201 or ENMA289A.
Formerly: ENMA289A.

ENMA300 Introduction to Materials Engineering (3 Credits)
Structure of materials, chemical composition, phase transformations, corrosion and mechanical properties of metals, ceramics, polymers and related materials. Materials selection in engineering applications.
Prerequisite: ENES100; and must have completed or be concurrently enrolled in PHYS260; and permission of ENGR-Materials Science & Engineering department.
Corequisite: MATH241.
Recommended: PHYS261 .
Cross-listed with: ENME382.
Restriction: Permission of ENGR-Mechanical Engineering department, or ENGR-Chemical Engineering department, or ENGR-Materials Science & Engineering department.
Credit Only Granted for: ENMA300 or ENME382.

ENMA301 Modern Materials Engineering (3 Credits)
Five topical areas will be presented, each leading up to specific applications that have recently come to market or are currently experiencing heavy research and development. The goal of each module will be to introduce the basic materials science principles necessary to understand these new areas.
Prerequisite: Minimum grade of C- in ENMA300.

ENMA312 Experimental Methods in Materials Science (3 Credits)
Introduction to experimental methods in materials characterization; synthesis of colloidal nanoparticles; X-ray diffraction and light scattering; optical microscopy; thermal conductivity and expansion; electrical measurements; heat capacity; computational materials design.
Prerequisite: ENMA300.
Corequisite: ENMA460.
Restriction: Junior standing or higher.

ENMA362 Mechanical Properties (3 Credits)
Overview of Mechanical Behavior, Elastic Behavior, Dislocations, Plastic Deformation, Strengthening of Crystalline Materials, Composite Materials, High Temperature Deformation of Crystalline Materials, Permanent Deformation of Noncrystalline Materials, Tensile Fracture at Low Temperatures, Engineering Aspects of Fracture, High Temperature Fracture, Fatigue, and Experimental determination of Mechanical Properties including Hardness of Metals and Strength of Metals, Polymers, Ceramics and Composites.
Prerequisite: ENMA300.
Restriction: Junior standing or higher; and permission of ENGR-Materials Science & Engineering department.

ENMA386 Experiential Learning (3-6 Credits)
Prerequisite: Must have Learning Proposal approved by the Office of Experiential Learning Programs, faculty sponsor, and student's internship sponsor.
Restriction: Junior standing or higher.

ENMA400 Introduction to Atomistic Modeling in Materials (3 Credits)
This is an introductory course designed to study atomistic modeling and simulation techniques used in materials research. This course covers the theories, methods, and applications of atomistic-scale modeling techniques in simulating, understanding, and predicting the properties of materials. Specific topics include: molecular statics using empirical force fields; quantum mechanical methods including density functional theory; molecular dynamics simulations; and Monte Carlo and kinetic Monte Carlo modeling.
Prerequisite: ENMA300, MATH206, and ENMA460.
Recommended: Basic knowledge in quantum mechanics (preferred but not required); basic knowledge in statistical mechanics (preferred but not required). Also offered as: ENMA600.
Credit Only Granted for: ENMA489A, ENMA400, ENMA698A, or ENMA600.
Formerly: ENMA489A.

ENMA401 Continuum Modeling of Materials (3 Credits)
Introduces continuum modeling techniques in materials science and engineering. This course covers and emphasizes the applications of continuum modeling techniques using COMSOL software package in simulating a range of materials phenomena and properties. Specific topics of continuum modeling include: The construction and analyses of continuum models using COMSOL software package; Structural mechanics; Heat transfer; Electrical current; Chemical species transport; Fluid flow; Multi-physics models coupling above phenomena.
Prerequisite: ENMA362, PHYS270, PHYS271, and MATH246; or equivalent; and ENMA165 or MATH206.
Restriction: Permission of ENGR-Materials Science & Engineering department.
Credit Only Granted for: ENMA401 or ENMA489C.
Formerly: ENMA489C.

ENMA410 Materials for Energy I (3 Credits)
The goal is to demonstrate the role of materials in solving one of the most critical socio-economic issues of our time, affordable and sustainable energy. There will be a discussion of U.S. and global energy and related environmental issues. Topics covered include: fuel cells and batteries (electrochemical energy conversion and storage); catalysts and membrane separations (fossil fuel and biomass energy conversion); and nuclear fuels.
Prerequisite: Minimum grade of C- in ENMA300; and permission of ENGR-Materials Science & Engineering department.
Credit Only Granted for: ENMA410 or ENMA489H.
Formerly: ENMA489H.

ENMA411 Materials for Energy II (3 Credits)
Demonstrates the role of materials in solving one of the most critical socio-economic issues of our time, affordable and sustainable energy. Materials for Energy is a two-part course based on material functionality; however, they are independent and neither is a prerequisite for the other. Materials for Energy II will focus on electrical, optical, thermal, and mechanically functional materials for energy devices. Solar cells, solar fuel, solar thermal, energy efficient lighting, building energy, thermoelectric and wind energy will be covered.
Prerequisite: Minimum grade of C- in ENMA300; and permission of ENGR-Materials Science & Engineering department.
Credit Only Granted for: ENMA411 or ENMA489I.
Formerly: ENMA489I.

ENMA414 Introduction to Solid State Ionics (3 Credits)
Solid State Ionics is the study of point defects in crystalline and non-crystalline solids; defect equilibria and transport; the influence of chemical and electric potentials, interfaces, and association; and the application of ionically conducting solids in solid-state electrochemical transducer systems and devices.
Prerequisite: ENMA300; and permission of ENGR-Materials Science & Engineering department.
Credit Only Granted for: ENMA414 or ENMA489W.
Formerly: ENMA489W.

ENMA421 Design of Composites (3 Credits)
Fundamentals of design, processing and selection composite materials for structural applications will be covered. The topics include a review of all classes of materials, an in-depth analysis of micro and macro mechanical behavior including interactions at the two-phase interfaces, modeling of composite morphologies for optimal microstructures, material aspects, cost considerations, processing methods including consideration of chemical reactions and stability of the interfaces, and materials selection considerations.
Restriction: Permission of ENGR-Materials Science & Engineering department.
Credit Only Granted for: ENMA421 or ENMA489A.
Formerly: ENMA489A.

ENMA422 Radiation Effects of Materials (3 Credits)
Ionizing radiation, radiation dosimetry and sensors, radiation processing, radiation effects on: polymers, metals, semiconductors, liquids, and gases. Radiation in advanced manufacturing, radiation-physical technology.
Prerequisite: ENMA300; and permission of ENGR-Materials Science & Engineering department.
Credit Only Granted for: ENMA422 or ENMA489E.
Formerly: ENMA489E.

ENMA425 Introduction to Biomaterials (3 Credits)
Examination of materials used in humans and other biological systems in terms of the relationships between structure, fundamental properties and functional behavior. Replacement materials such as implants, assistive devices such as insulin pumps and pacemakers, drug delivery systems, biosensors, engineered materials such as artificial skin and bone growth scaffolds, and biocompatibility will be covered.
Recommended: ENMA300.
Restriction: Permission of ENGR-Materials Science & Engineering department.
Credit Only Granted for: BIOE453, CHBE457, or ENMA425.

ENMA426 Reliability of Materials (3 Credits)
Students are taught the basic degradation mechanisms of materials, through the understanding of the physics, chemistry, mechanics of such mechanisms. Mechanical failure mechanisms concentrate on fatigue, and creep. Chemical failure mechanisms emphasize corrosion and oxidation. Physical mechanisms such as diffusion, electromigration, defects and defect migration, surface trapping mechanisms, charge creation and migration are also included.
Restriction: Permission of ENGR-Materials Science & Engineering department.
Credit Only Granted for: ENMA426 or ENMA489R.
Formerly: ENMA489R.

ENMA431 Nanomechanics of Biomaterials (3 Credits)
Focuses on the latest scientific developments and discoveries in the nanoscale structure and properties of biological materials. The course begins with introductory lectures on the various nanostructures of biomaterials, and their physiological roles under mechanical forces. General aspects of biopolymers, protein folding, and self-assembly are also covered. Next, a series of in-depth lectures are presented on the characterization methods of nanomechanical properties using single molecule techniques. Finally, current applications of nanobiomaterials in the area of molecular machines, molecular self-assembly, and nanoscaffold are discussed.
Prerequisite: ENMA300; and permission of ENGR-Materials Science & Engineering department.
Credit Only Granted for: ENMA431 or ENMA489B.
Formerly: ENMA489B.

ENMA434 Quantum Mechanics for Engineers (3 Credits)
Provides engineering students with a foundational understanding of quantum mechanics and its practical applications in the field of materials science. This course will equip students with the essential knowledge and skills required to harness the principles of quantum mechanics in their pursuit of innovative solutions in materials science and engineering.
Prerequisite: MATH241 and PHYS270.
Restriction: Permission of ENGR-Materials Science & Engineering department.

ENMA435 Wide Bandgap Materials and Devices (3 Credits)
Presents the materials science of wide bandgap materials and analyzes the defects present in such materials from a device performance point of view.
Prerequisite: ENMA300 and ENMA465.
Corequisite: ENMA460.
Jointly offered with: ENMA635.
Restriction: Permission of ENGR-Materials Science & Engineering department.
Credit Only Granted for: ENMA435 or ENMA635.

ENMA436 Introduction to Quantum Materials and Devices (3 Credits)
Quantum materials and devices are an emerging field in materials engineering and physics which offer new approaches to electronics and photonics. This course serves as an introduction to quantum materials and their applications in quantum technologies. It will teach concepts needed to understand the quantum mechanical properties of materials and connect their fundamental properties to quantum device applications. Topics will include low-dimensional materials, strongly correlated electron systems, topology in solids, and light-matter interactions
Prerequisite: ENMA460 and ENMA461 .
Jointly offered with: ENMA636.
Restriction: Permission of ENGR-Materials Science & Engineering department.
Credit Only Granted for: ENMA436 or ENMA636.

ENMA437 Machine Learning for Materials Science (3 Credits)
Familiarizes students with basic as well as state of the art knowledge of machine learning and its applications to materials science and engineering. Covers the range of machine learning topics with applications including feature identification and extraction, determining predictive descriptors, uncertainty analysis, and identifying the most informative experiment to perform next. One focus of the class is to build the skills necessary for developing an autonomous materials research system, where machine learning controls experiment design, execution, and analysis in a closed-loop.
Prerequisite: MATH461, ENMA300, and ENMA165 or equivalent.
Jointly offered with: ENMA637.
Restriction: Permission of ENGR-Materials Science & Engineering department.
Credit Only Granted for: ENMA437 or ENMA637.

ENMA440 Nano Plasma Processing of Materials (3 Credits)
Sustaining mechanisms of plasmas are covered, especially low-pressure electrical gas discharges, fundamental plasma physics, sheath formation, electric and magnetic field effects, plasma-surface interactions in chemically reactive systems, plasma diagnostic techniques and selected industrial applications of low pressure plasmas.
Restriction: Permission of ENGR-Materials Science & Engineering department.
Credit Only Granted for: ENMA440, ENMA489P, ENMA640, or ENMA698P.
Formerly: ENMA489P.

ENMA441 Characterization of Materials (3 Credits)
Techniques to characterize the properties of materials whose characteristic dimensions range from nanometers to macroscopic. These include conventional crystalline and noncrystalline materials, with a special attention to materials of current technological interest. The course will include recent results from the scientific literature.
Prerequisite: ENMA300, ENMA165 or MATH206.
Restriction: Permission of ENGR-Materials Science & Engineering department; and senior standing.
Credit Only Granted for: ENMA489T or ENMA441.
Formerly: ENMA489T.

ENMA443 Phontonic Materials, Devices and Reliability (3 Credits)
The course focuses on the understanding of the basic optical processes in semiconductors, dielectrics and organic materials. The application of such materials in systems composed of waveguides, light emitting diodes and lasers, as well as modulators is developed.
Restriction: Permission of ENGR-Materials Science & Engineering department; and junior standing or higher.
Credit Only Granted for: ENMA443 or ENMA489Z.
Formerly: ENMA489Z.

ENMA445 Liquid Crystals and Structured Soft Materials (3 Credits)
Elective course on the properties and behavior of liquid crystals and related soft materials, and their relationship to biomaterials and to applications.
Prerequisite: MATH246, PHYS270, and PHYS271.
Restriction: Permission of ENGR-Materials Science & Engineering department.
Credit Only Granted for: ENMA445 or ENMA489L.
Formerly: ENMA489L.

ENMA460 Introduction to Solid State Physics (3 Credits)
Classes of materials; introduction to basic ideal and real materials' behavior including mechanical, electrical, thermal, magnetic and optical responses of materials; importance of microstructure in behavior. One application of each property will be discussed in detail.
Prerequisite: PHYS271, PHYS270, and MATH241.
Cross-listed with: PHYS431.
Restriction: Junior standing or higher; and must be in the Engineering: Materials Science program or Physics program.
Credit Only Granted for: ENMA460 or PHYS431.
Additional Information: Materials Engineering students take ENMA460 and Physics students take PHYS431.

ENMA461 Thermodynamics of Materials (3 Credits)
Thermodynamic aspects of materials; basic concepts and their application in design and processing of materials and systems. Topics include: energy, entropy, adiabatic and isothermal processes, internal and free energy, heat capacity, phase equilibria and surfaces and interfaces.
Prerequisite: ENMA300.
Restriction: Junior standing or higher.

ENMA463 Macroprocessing of Materials (3 Credits)
Processing of modern, bulk engineering materials. Raw materials, forming, firing, finishing and joining. More emphasis on metals and ceramics than polymers.
Prerequisite: ENMA300.
Restriction: Junior standing or higher.

ENMA464 Environmental Effects on Engineering Materials (3 Credits)
Introduction to the phenomena associated with the resistance of materials to damage under severe environmental conditions. Oxidation, corrosion, stress corrosion, corrosion fatigue and radiation damage are examined from the point of view of mechanism and influence on the properties of materials. Methods of corrosion protection and criteria for selection of materials for use in radiation environments.
Prerequisite: ENMA300. Or permission of ENGR-Materials Science & Engineering department; and permission of instructor.

ENMA465 Microprocessing Materials (3 Credits)
Micro and nanoscale processing of materials. Emphasis on thin film processing for advanced technologies.
Prerequisite: ENMA300.
Restriction: Permission of ENGR-Materials Science & Engineering department.
Credit Only Granted for: ENMA363, ENMA489B, or ENMA465.
Formerly: ENMA363.

ENMA466 Advanced Materials Fabrication Laboratory (3 Credits)
This course allows students an opportunity to study advanced materials systems in depth through a combination of lectures and hands-on laboratory experiments. Students will be trained in materials processing and characterization techniques. Each student will fabricate materials and devices in our state-of-the-art nanofabrication clean room facility (Fablab), as well as evaluate them using a variety of characterization techniques.
Prerequisite: ENMA465; and permission of ENGR-Materials Science & Engineering department.

ENMA470 Materials Selection for Engineering Design (3 Credits)
Students will learn about materials classes, properties, limitations and applications and the methodology of materials selection in engineering design.
Prerequisite: Permission of ENGR-Materials Science & Engineering department.
Restriction: Junior standing or higher.
Credit Only Granted for: ENMA 470 or ENMA 489O.
Formerly: ENMA 489O.

ENMA471 Kinetics, Diffusion and Phase Transformations (3 Credits)
Fundamentals of diffusion, the kinetics of reactions including nucleation and growth and phase transformations in materials.
Prerequisite: Must have completed or be concurrently enrolled in ENMA461.
Restriction: Junior standing or higher; or permission of ENGR-Materials Science & Engineering department.

ENMA472 Additive Manufacturing of Materials (3 Credits)
Additive manufacturing approaches for metals, ceramics and polymers will be explored in terms of manufacturability and how processing parameters affect microstructure and properties. The course will include projects, including a Terrapin Works project to design and build a part, to develop an understanding of the current state of additive manufacturing, its future promise and its limitations.
Prerequisite: ENMA300.
Restriction: Must be in Engineering: Materials Science program.
Credit Only Granted for: ENMA472 or ENMA672.

ENMA473 Engineering Using High Strength Metals and Alloys (3 Credits)
This is a class focused on the materials engineering challenges of applying high strength metals and alloys to solutions. The extraordinary properties of these alloys derive from (1) highly metastable microstructures, (2) high strengths and melting points of the base metals, (3) complicated processing and fabrication procedures, and (4) their resulting complex behavior in extreme environments. This course will give you the knowledge base you need to select, apply and troubleshoot the performance of high strength metals and alloys in a variety of applications.
Prerequisite: Minimum grade of C- in ENMA300 and permission of ENGR-Materials Science & Engineering department.

ENMA474 Introduction to Computational Materials Science (3 Credits)
This is an introductory course aiming for junior and senior undergraduate students to study atomistic modeling and simulation techniques that are used in materials science. This course covers the theories and applications of atomistic scale modeling techniques to simulate, understand, and predict the properties of materials. Topics include: molecular statics, quantum mechanical methods, molecular dynamics simulations and Monte Carlo simulations.
Restriction: Permission of ENGR-Materials Science & Engineering department.
Credit Only Granted for: ENMA474 or ENMA489A.
Formerly: ENMA489A.

ENMA475 Fundamentals of Diffraction Techniques in Materials Science (3 Credits)
This course looks at the advanced methods of x-ray scattering/diffraction available thanks to the more powerful sources available to us. The availability of these sources enables us to study liquid crystals, polymers, nanomaterials, quasiorganized materials (including nano) and disordered materials.
Prerequisite: MATH246, PHYS270, and PHYS271.
Restriction: Permission of ENGR-Materials Science & Engineering department.
Credit Only Granted for: ENMA475 or ENMA489M.
Formerly: ENMA489M.

ENMA476 NanoManufacturing: Materials Design and Systems Integration (3 Credits)
The fundamentals of nanomanufacturing based on state-of-the-art and future prospects in materials design and systems integration. The course examines functional nanomaterials design and synthesis, structural assembly from nanoscale to macroscale, and device fabrication. Distinct from the current curricular paradigm in many nanotechnology programs that focus on underlying science, this course emphasizes the immediate need for scale-up, process robustness, and system integration issues. Featuring case studies from industry, end of chapter problems, and study questions, the course is for upper-level undergraduate and graduate students, who are interested in the future of manufacturing innovation and technology.
Restriction: Must be in Engineering: Materials Science program.

ENMA481 Introduction to Electronic and Optical Materials (3 Credits)
Electronic, optical and magnetic properties of materials. Emphasis on materials for advanced optoelectronic and magnetic devices and the relationship between properties and the processing/fabrication conditions.
Prerequisite: Minimum grade of C- in ENMA300 and MATH246 .
Recommended: ENMA460 and ENMA465.
Restriction: Permission of ENGR-Materials Science & Engineering department.

ENMA482 Introduction to Electron Microscopy (3 Credits)
An introduction of the basic principles of operation for modern electron microscopes. Details will be given on the construction of microscopes, their basic operation, and the types of questions that can be addressed with an electron microscope. Emphasis will be placed on a conceptual understanding of the underlying theories. Where appropriate, mathematical descriptions will be utilized. Upon completion of this course, students will be excepted to have a basic understanding sufficient to give interpretations of microscopy images and to suggest the correct tool or approach for certain research studies.
Prerequisite: PHYS142, PHYS122, or PHYS260.
Credit Only Granted for: ENMA482 or ENMA489J.
Formerly: ENMA489J.

ENMA486 Seminar in Materials Science and Engineering (1 Credit)
Current research in materials science and engineering and related fields. The lectures are presented by scientists and engineers from academia, national laboratory, US government, etc., in the format of seminars.
Restriction: Must be in Engineering: Materials Science program.

ENMA487 Capstone Preparation (1 Credit)
In preparation for the senior level design course, students will do background research and develop white papers from which teams will form around short listed design projects. The projects should focus on a society, industry, military or technological based problem in Materials Science and Engineering leading to a design and strategy to address the problem in the following course, ENMA 490. The course will include written and oral presentations of the white papers and team proposals.
Restriction: Must be in Engineering: Materials Science program; and senior standing; and permission of ENGR-Materials Science & Engineering department.

ENMA489 Selected Topics in Engineering Materials (3 Credits)
Selected topics of current importance in materials science and engineering.
Restriction: Permission of ENGR-Materials Science & Engineering department.
Repeatable to: 12 credits if content differs.

ENMA490 Materials Design (3 Credits)
Capstone design course. Students work in teams on projects evaluating a society or industry based materials problem and then design and evaluate a strategy to minimize or eliminate the problem; includes written and oral presentations.
Prerequisite: Minimum grade of C- in ENMA487.
Restriction: Senior standing.

ENMA495 Polymeric Engineering Materials I (3 Credits)
Study of polymeric engineering materials and the relationship to structural type. Elasticity, viscoelasticity, anelasticity and plasticity of single and multiphase materials. Emphasis is on polymetric materials.
Prerequisite: ENMA300.
Restriction: Permission of ENGR-Materials Science & Engineering department.

ENMA496 Polymeric Materials: Structure, Property, and Processing (3 Credits)
An intermediate level treatment of structures of polymers. An introduction to mechanical properties and processing of polymeric materials. Emphasis will be on how to establish the structure-property relationship and on how to achieve such understanding via different characterization methods.
Prerequisite: ENMA300; and permission of ENGR-Materials Science & Engineering department.
Cross-listed with: CHBE496.
Credit Only Granted for: ENMA496 or CHBE496.

ENMA499 Independent Undergraduate Research (1-3 Credits)
Students work with a faculty member on an individual laboratory project in one or more of the areas of engineering materials. Students will design and carry out experiments, interpret data and prepare a comprehensive laboratory report.
Restriction: Permission of ENGR-Materials Science & Engineering department; and junior standing or higher; and prior work with the research mentor.
Repeatable to: 6 credits if content differs.

ENME - Engineering, Mechanical

ENME201 Careers in Mechanical Engineering (1 Credit)
The Mechanical Engineering Curriculum, Career Paths. Research areas in the Mechanical Engineering Department. The Mechanical Engineering Profession.

ENME202 Computing Fundamentals for Engineers (3 Credits)
Introduction to computer programming for the solution of engineering problems. Python & MATLAB languages including flow control, functions, file handling, arrays, and data structures. Students will be introduced to computing fundamentals, principles of software engineering, object-oriented programming, and algorithms.
Corequisite: Must be concurrently enrolled in MATH141.
Restriction: Permission of ENGR-Mechanical Engineering department.
Credit Only Granted for: ENAE202 or ENME202.

ENME207 Fabrication and Machine Tool Practices for Engineering (2 Credits)
In order to make the best decisions in product design and development, it is important to understand the capabilities and limitations of different fabrication techniques. Students will learn to identify machine parts and functions, define machine shop terminology, calculate shop formulas and theories, execute machine operations, and apply proper measuring tools.
Prerequisite: PHYS161. And ENME272; or students who have taken courses with comparable content may contact the department.
Restriction: Permission of ENGR-Mechanical Engineering department.

ENME208 Introduction to Automotive Engineering and Design (2 Credits)
Selected concepts in automotive engineering and design at the introductory level utilizing the Terps Racing Baja SAE student project as a learning instrument. This class compliments ENME408, Automotive Design, which focuses on the Terps Racing Formula SAE car.
Prerequisite: ENES100.
Recommended: ENES220; and ENES221.
Restriction: Permission of ENGR-Mechanical Engineering department.
Repeatable to: 4 credits if content differs.

ENME272 Introduction to Computer Aided Design (2 Credits)
Fundamentals of CAD, using solid modeling packages (Pro/E, SolidWorks, and Autodesk Inventor). Two and three dimensional drawing. Dimensioning and specifications. Introduction of CAD based analysis tools. Students will complete a design project.
Prerequisite: Must have completed or be concurrently enrolled in MATH141.
Restriction: Permission of ENGR-Mechanical Engineering department.
Credit Only Granted for: ENME414 or ENME272.

ENME289 Exploring Topics in Mechanical Engineering (2 Credits)
Introductory Design Topics in the Field of Mechanical Engineering.
Repeatable to: 4 credits if content differs.

ENME299 Topics in Mechanical Engineering (1-3 Credits)
Introductory topics in the field of mechanical engineering.
Restriction: Permission of ENGR-Mechanical Engineering department.
Repeatable to: 6 credits if content differs.

ENME299Q Quantum Steampunk Science-Fiction Workshop (3 Credits)
Steampunk is a science-fiction genre in which futuristic technologies populate Victorian-era settings. Recently, steampunk has come to life in the scientific field of quantum thermodynamics. Thermodynamics, the study of energy, grew out of the Industrial Revolution. Two centuries later, quantum physics is transforming computing and cryptography. Quantum science is now revolutionizing 19th-century thermodynamics in quantum thermodynamics, which features quantum engines, automata, and more. Quantum thermodynamics inspired the growing subgenre of quantum steampunk. In this course, you will read science fiction, write quantum steampunk short stories, receive feedback, and critique classmates' writing. In parallel, you will learn about quantum physics, technologies, and thermodynamics.
Cross-listed with: ARHU270, CHEM298Q, CMSC298Q, PHYS299Q.
Credit Only Granted for: ARHU270, ARHU298Q, CHEM298Q, CMSC298Q, ENME299Q or PHYS299Q.

ENME331 Fluid Mechanics (3 Credits)
Principles of fluid mechanics. Mass, momentum and energy conservation. Hydrostatics. Control volume analysis. Internal and external flow. Boundary layers. Modern measurement techniques. Computer analysis. Laboratory experiments.
Prerequisite: ENES232 and ENES221.
Credit Only Granted for: BIOE331, ENCE305, ENFP300, or ENME331.

ENME332 Transfer Processes (3 Credits)
The principles of heat transfer. Conduction in solids. Convection. Radiation. Modern measurement techniques. Computer analysis.
Prerequisite: ENME331.
Credit Only Granted for: ENME332 or ENFP312.

ENME350 Electronics and Instrumentation I (3 Credits)
Modern instrumentation. Basic circuit design, standard microelectronic circuits. Digital data acquisition and control. Signal conditioning. Instrumentation interfacing. Designing and testing of analog circuits. Laboratory experiments.
Prerequisite: PHYS271 and PHYS270.

ENME351 Electronics and Instrumentation II (3 Credits)
Continuation of ENME 350. Modern instrumentation. Basic circuit design, standard microelectronic circuits. Digital data acquisition and control. Signal conditioning. Instrumentation interfacing. Designing and testing of analog circuits. Laboratory experiments.
Prerequisite: PHYS271, ENME350, and PHYS270.

ENME361 Vibration, Controls and Optimization I (3 Credits)
Fundamentals of vibration, controls and optimization. Analysis and design in time, Laplace and frequency domains. Mathematical description of system response, system stability, control and optimization. Optimal design of mechanical systems.
Prerequisite: ENES220, ENES221, and MATH246; and (MATH206 or ENME202).
Restriction: Must be in Engineering: Mechanical program.

ENME371 Product Engineering and Manufacturing (3 Credits)
The course provides students with information on a typical product design process with hands-on experience through team projects. Content includes applying technical analysis to real world systems, relationship of design to manufacturing, role of statistics in product development, and business aspects of product development. Throughout the semester, students will participate on a product study and test team; prepare technical reports and communications; and present findings from a short design project before an audience of peers and instructors.
Prerequisite: Minimum grade of C- in ENES221; and must have completed or be concurrently enrolled in ENME392.
Restriction: Must be in Engineering: Mechanical program.

ENME382 Introduction to Materials Engineering (3 Credits)
Structure of materials, chemical composition, phase transformations, corrosion and mechanical properties of metals, ceramics, polymers and related materials. Materials selection in engineering applications.
Prerequisite: ENES100; and must have completed or be concurrently enrolled in PHYS260; and permission of ENGR-Materials Science & Engineering department.
Corequisite: MATH241.
Recommended: PHYS261 .
Cross-listed with: ENMA300.
Restriction: Permission of ENGR-Mechanical Engineering department, or ENGR-Chemical Engineering department, or ENGR-Materials Science & Engineering department.
Credit Only Granted for: ENMA300 or ENME382.

ENME392 Statistical Methods for Product and Processes Development (3 Credits)
Integrated statistical methodology for the improvement of products and processes in terms of performance, quality and cost. Designed experimentation. Statistical process control. Software application. Laboratory activities.
Prerequisite: Minimum grade of C- in MATH241 and ENME202.
Restriction: Permission of the Mechanical Engineering Department.

ENME400 Machine Design (3 Credits)
Design of mechanical elements and planar machines. Failure theories. Design of pressure vessels, joints, rotating elements, and transmission elements. Kinematic structures, graphical, analytical, and numerical analysis and synthesis of linkages, gear trains, and flywheels are covered.
Prerequisite: Must have completed or be concurrently enrolled in ENME361.
Restriction: Permission of ENGR-Mechanical Engineering department.

ENME401 Entrepreneurial Design Realization (3 Credits)
The vision for this course, and an aspect that makes it unique, is to expose students to the opportunities and challenges of bringing a product design to reality (entrepreneurship). The emphasis is on environmentally and socially sustainable projects. The end-product of this course will be full-scale implementations or complete design "packages" that can be taken to potential stakeholders.
Cross-listed with: ENES401.
Restriction: Must have senior standing and permission of instructor.
Credit Only Granted for: ENME401, ENME489B or ENES401.
Formerly: ENME489B.

ENME406 Roller Coaster Engineering (3 Credits)
Engineering of roller coasters including: specifications, concept creation, structural design, car design, and safety. Course covers biomechanics and rider kinematics as well as manufacturing aspects.
Prerequisite: ENES220, ENES221, and ENME272. And ENME202; or MATH206.
Corequisite: ENME400.
Restriction: Permission of ENGR-Mechanical Engineering department.

ENME407 Sustainability, Climate Change and Renewable Energy Systems (3 Credits)
Countries around the world are developing innovative and sustainable solutions that not only help to protect the environment from the threats of global climate change, but that also can improve human health and quality of life. In this course students will explore solutions to climate change, as well as geothermal and hydroelectric energy systems and their applications.
Prerequisite: PHYS260; or permission of ENGR-Mechanical Engineering department.
Restriction: Students must have completed a minimum of 60 credits by the time they will enroll in this course.

ENME408 Selected Topics in Engineering Design (3 Credits)
Creativity and innovation in design. Generalized performance analysis, reliability and optimization as applied to the design of components and engineering systems. Use of computers in design of multivariable systems.
Restriction: Must be in Engineering: Mechanical program; and senior standing. Or permission of ENGR-Mechanical Engineering department.
Repeatable to: 6 credits if content differs.

ENME410 Design Optimization (3 Credits)
Introduction to the formal process of design optimization, including analytical and computational methods. Step by step design optimization techniques. Design optimization concepts, necessary and sufficient optimality conditions and solution techniques. Solution evaluation and tradeoff exploration.
Prerequisite: ENME271; or MATH206.
Restriction: Permission of ENGR-Mechanical Engineering department; and junior or senior standing.

ENME413 Bio-Inspired Robotics (3 Credits)
Fundamentals and applications of biologically inspired robots, traditional robots, and design and fabrication of biologically inspired robots.
Prerequisite: Must have completed or be concurrently enrolled in ENME351.
Restriction: Permission of ENGR-Mechanical Engineering department.
Credit Only Granted for: ENME413 or ENME489L.
Formerly: ENME489L.

ENME416 Additive Manufacturing (3 Credits)
Develop a comprehensive understanding of fundamental additive manufacturing, 3D printing approaches, including: extrusion-based deposition, stereolithography, powder bed-based melting, and inkjet-based deposition. Cultivate a design for-additive manufacturing skillset for CAD and CAM methodologies to produce successful 3D prints. Fabricate 3D mechanical objects using a variety of 3D printing technologies on campus. Execute a design project that demonstrates how additive manufacturing technologies can overcome critical limitations of traditional manufacturing processes.
Prerequisite: ENME331. And ENME272; or ENME414.
Restriction: Permission of ENGR-Mechanical Engineering department.

ENME417 Numerical Methods in Engineering (3 Credits)
Covers the fundamental aspects of how to apply analytical mathematical concepts to discrete data. The course is aimed at graduate students and senior undergraduate students in any area of engineering, and treats the material in a general manner that is not specific to any application or field of specialization.
Recommended: Senior standing.
Jointly offered with: ENME745.
Restriction: Permission of ENGR-Mechanical Engineering department.
Credit Only Granted for: ENME745, ENME808B, ENME417 or ENME489J.
Formerly: ENME489J.

ENME420 Energy Audit for Decarbonization and Sustainability Enhancement (3 Credits)
Provides students with fundamentals and applications of de-carbonization of building systems for energy sustainability through energy audit and efficiency measures, renewable energy, and electrification. Topics covered include societal and economic motivations for de-carbonization of buildings; building energy auditing and energy consumption analysis; lighting systems and controls; heating/cooling and ventilation systems; integrated building automation systems; fundamentals of renewable energy for building applications; fundamentals of building electrification and energy storage devices; emerging technologies for building energy sustainability.
Prerequisite: ENES232 .
Corequisite: ENME332.
Restriction: Permission of the department.
Credit Only Granted for: ENME420 or ENME489I.
Formerly: ENME489I.

ENME421 Engineering Design Ideation (3 Credits)
Engineering Design Methods is a technical elective for engineering students who wish to improve their ability to produce design ideas (i.e., the ideation process) for further development into conceptual ideas. Ideation is the creative, idea generation activity that happens at the beginning of the conceptual design process. Ideation methods are often built around creativity improving strategies and are often designed for individual use prior to presenting the results in a team setting.
Prerequisite: Must have completed or be concurrently enrolled in ENME371.
Restriction: Junior standing or higher.
Additional Information: Ideally, this course should be taken prior to capstone design.

ENME422 Indoor Environment and Mechanical Systems (3 Credits)
Fundamentals of indoor air quality and its measurements. Exploration of air cleaning technologies for gaseous, particulate and infectious agent contaminants. Simulations of air flow and contaminants with multi-zone models to allow testing of both contaminant dispersion in buildings and effectiveness of air cleaning technologies.
Prerequisite: ENES232 and ENME332.
Jointly offered with: ENME753.
Credit Only Granted for: ENME422 or ENME753.

ENME423 Modern Climate Control and Building Energy Design/Analysis (3 Credits)
Fundamentals and design calculations of heat and moisture transfer in buildings; evaluation of cooling, heating and power requirements of buildings; building energy consumption simulations, use of alternative energy and energy conservation measures in buildings; fundamentals of fans/pumps and air/water distribution in buildings; introduction to refrigeration and energy systems for data centers and other mission-critical facilities.
Prerequisite: ENES232.
Corequisite: ENME332.
Restriction: Permission of ENGR-Mechanical Engineering department.

ENME424 Urban Microclimate and Energy (3 Credits)
Urban microclimate from the perspective of transient heat and mass transfer using building energy simulations for building clusters as well as LEED building certification criteria. The focus is on understanding building energy consumption and environmental impacts from the individual building scale to a neighborhood scale.
Prerequisite: ENES232; and must have completed or be concurrently enrolled in ENME332 .
Jointly offered with: ENME742.
Restriction: Permission of ENGR-Mechanical Engineering department.
Credit Only Granted for: ENME424 or ENME742.

ENME425 Energy Conversion Systems for Sustianability (3 Credits)
Focus on energy sustainability with view on changing global energy availability and use. Addresses the objective of greatly reducing our dependence on the finite amounts of fossil energy sources available for our quest to achieve environmentally benign sustainable energy for green environment. The emphasis will be on sustainability issues, discussion on supply, demand and storage, energy transmission, global warming and carbon management, biomass-resources, uses and production of biofuels, national energy policy discussion, carbon emission, energy security and economics to ensure future energy needs can be met without compromising the ability of future generation to meet their own needs with due considerations to increase in global temperatures.
Prerequisite: ENES232.
Restriction: Permission of the Mechanical Engineering Department.
Credit Only Granted for: ENME489X or ENME425.
Formerly: ENME489X.

ENME426 Production Management (3 Credits)
The basic concepts and models needed to understand and design manufacturing systems, including the history of manufacturing, performance measures, queuing systems, variability, production planning and scheduling, lean manufacturing, and pull production control.
Credit Only Granted for: BMGT385 or ENME426.

ENME427 CSI Mechanical: Finding Reasons for Compromised Structural Integity (3 Credits)
Understanding the causes of product failures including the political, societal, economic, environmental, and ethical impact of these failures, and the strategies to avoid, postpone, or mitigate them. Students will be encouraged to combine concepts from engineering, natural sciences, social sciences, and the humanities to address these complex issues. Basics of failure analysis, forensics, and reliability engineering and the scientific fundamentals underlying the most common types of failure. Issues of legal liability. Methods for monitoring the existing condition of a structure.
Prerequisite: ENES220 and ENME382.
Restriction: Permission of ENGR-Mechanical Engineering department.

ENME430 Fundamentals of Nuclear Reactor Engineering (3 Credits)
Fundamental aspects of nuclear physics and nuclear engineering, including nuclear interactions; various types of radiation and their effects on materials and humans; and basic reactor physics topics, including simplified theory of reactor critically.
Prerequisite: MATH246.
Restriction: Permission of ENGR-Mechanical Engineering department.

ENME431 Nuclear Reactor Systems and Safety (3 Credits)
Engineering, material and thermal aspects of light water reactors, fast reactors, high temperature gas reactors, heavy water moderated reactors, breeder reactors, advanced reactors including GEN IV designs. Evolution of light water reactor safety and regulation in the US that has culminated in the current body of regulations.
Prerequisite: MATH246.
Recommended: ENME430.
Restriction: Permission of ENGR-Mechanical Engineering department.

ENME432 Reactor and Radiation Measurements Laboratory (3 Credits)
Basics concepts of nuclear radiation and radiation detectors including types of radiation, radioactive decay, and interactions of radiation with matter.
Prerequisite: ENME430 and MATH246.
Restriction: Permission of ENGR-Mechanical Engineering department.

ENME433 Nuclear Reactor Design (3 Credits)
Principles of nuclear reactor engineering including nuclear reactor system design, materials, thermal-hydraulics, shielding, mechanical design, and safety analysis.
Restriction: Permission of ENGR-Mechanical Engineering department.
Credit Only Granted for: ENME433 or ENME489T.
Formerly: ENME489T.

ENME434 Engineering Quantum Systems and Sensors (3 Credits)
Designed for students interested in learning quantum mechanics from a technological perspective, illustrated through specific examples from quantum engineering at the nanoscale and from discrete quantum systems. The focus is not on textbook examples such as hydrogen atom solutions and angular momentum algebra. Instead, focus areas would be quantum sensors and systems, description and control of quantum noise, which should elicit particular appeal across many areas of engineering and physical sciences. The course will prepare students for emerging quantum technologies besides computing and cryptography that are part of the Quantum 2.0 revolution.
Prerequisite: PHYS270 and MATH141.
Recommended: Any MATH 240, MATH 461, MATH341, or ENEE290 or equivalent courses covering linear algebra, eigenvalues, and eigenvectors.
Jointly offered with: ENME692.
Restriction: Permission of Mechanical Engineering department.
Credit Only Granted for: ENME434 or ENME692.

ENME435 Remote Sensing Instrumentation (3 Credits)
Explores the fundamentals of remote sensing techniques including light detection and ranging (lidar), radar, and computer vision in the context of emerging technologies such as autonomous navigation, terrain modeling, and embedded smart devices.
Prerequisite: ENME351.
Restriction: Permission of ENGR-Mechanical Engineering department.
Credit Only Granted for: ENME435 or ENME489Y.
Formerly: ENME489Y.

ENME436 Renewable Energy (3 Credits)
Fundamentals, design/analysis tools, and state of the art renewable energy technologies. Energy resources and global perspectives of current and future energy demand/consumption trends, followed by prime renewable energy technologies, including wind, solar, hydro, geothermal, and ocean thermal energy conversion. Economics of renewable energy, energy conservation opportunities, CO2 capture and storage, and thermal energy storage.
Prerequisite: ENME331.
Restriction: Must be in a major within the ENGR-Mechanical Engineering department.
Credit Only Granted for: ENME489K or ENME436.
Formerly: ENME489K.

ENME437 Data Science in Manufacturing Quality Control (3 Credits)
Introduces manufacturing quality management in the big data era. Students will learn quality improvement philosophies, statistical modeling of process quality (statistical process control and control charts), and measurement system analysis (gauge repeatability and reproducibility). Students will also explore the application of machine learning towards quality prediction and classification of manufactured products, and understand the limitations of applied supervised and unsupervised machine learning in the realm of manufacturing quality control.
Prerequisite: A minimum grade of C- in ENME202 and ENME392.
Jointly offered with: ENME697.
Restriction: Permission of ENGR-Mechanical Engineering department .
Credit Only Granted for: ENME437 or ENME697.

ENME440 Applied Machine Learning for Engineering and Design (3 Credits)
Learn how to apply techniques from Artificial Intelligence and Machine Learning to solve engineering problems and design new products or systems. Design and build a personal or research project that demonstrates how computational learning algorithms can solve difficult tasks in areas you are interested in. Master how to interpret and transfer state-of-the-art techniques from computer science to practical engineering situations and make smart implementation decisions.
Prerequisite: ENME392; or permission of instructor.
Jointly offered with: ENME743.
Restriction: Permission of ENGR-Mechanical Engineering department.
Credit Only Granted for: ENME440 or ENME743.

ENME441 Mechatronics and the Internet of Things (3 Credits)
Mechatronics and the Internet of Things combines sensors, actuators, computation, and communication to realize integrated objects capable of robust Internet-based interfacing. Students will gain experience with circuit development, mechatronic systems, MicroPython coding, and Internet communication protocols using the ESP32 microcontroller platform. The project-focused course combines lectures and hands-on labs to drive learning at the convergence of mechanics, electronics, and software domains for IoT smart object development.
Prerequisite: ENME351.
Restriction: Permission of ENGR-Mechanical Engineering department.
Credit Only Granted for: ENME489B or ENME441.
Formerly: ENME489B.

ENME442 Information Security (3 Credits)
The materials presented are divided into three major components: overview, detailed concepts and implementation techniques. The topics to be covered are: general security concerns and concepts from both a technical and management point of view, principles of security, architectures, access control and multi-level security, trojan horses, covert channels, trap doors, hardware security mechanism, security models, security kernels, formal specifications and verification, networks and distribution systems and risk analysis.
Restriction: Must have Senior standing in engineering; and permission of ENGR-Mechanical Engineering department. Jointly offered with ENRE684 .
Credit Only Granted for: ENRE648J, ENME442, ENRE684, or ENPM808E.

ENME444 Assistive Robotics (3 Credits)
Fundamentals of assistive robots used in a wide varietyof ways to help humans with disabilities. Three application areas will be covered: (1) Rehabilitation robotics to recover motor function from neurologic injuries such as stroke, (2) Prosthetics to enable mobility function in amputees, and (3) Social robotics for cognitive impairment and developmental disorders such as autism. Theory behind different control systems employed by assistive robotics, as well as the mechanical design, sensors & actuators, and user interfaces behind representative robots in the respective areas. Guidelines for designing assistive robots. Ethical and regulatory considerations in the design of assistive robots.
Prerequisite: ENME351; and must have completed or be concurrently enrolled in ENME462.
Restriction: Permission of ENGR-Mechanical Engineering department.

ENME445 Design for Reliability (3 Credits)
Failure prevention, accident prevention, design requirements analysis, designing right the first time, high system reliability, software reliability, manufacturing defect prevention, life cycle costs reduction, design reviews, managing the design for reliability, design trustworthiness, product durability, and writing good specifications are covered.
Restriction: Junior standing or higher.

ENME446 Medical Robotics (3 Credits)
The fundamentals of robot design, control and different areas of research regarding development are explored. Student will engage in a course project where they will learn to develop, build, and control a medical robot. Surgical robotics development and modeling of robotic systems, safety in medical robotics, haptics, ergonomics and surgery. Fundamentals of robot design and control. Kinematics. This proposal was approved through the Testudo Curriculum Management system.
Prerequisite: Must have completed or be concurrently enrolled in ENME361.
Restriction: Permission of ENGR-Mechanical Engineering department.
Credit Only Granted for: ENME489C, ENME808M or ENME446.
Formerly: ENME489C.

ENME454 Vehicle Dynamics (3 Credits)
The fundamentals of passenger vehicle and light truck design and vehicle dynamics are covered. The engineering principles associated with acceleration, braking, handling, ride quality, aerodynamics, and tire mechanics are discussed, as well as suspension and steering design.
Corequisite: ENME361.
Restriction: Permission of ENGR-Mechanical Engineering department.

ENME461 Control Systems Laboratory (3 Credits)
Students will design, implement, and test controllers for a variety of systems. This will enhance their understanding of feedback control familiarize them with the characteristics and limitations of real control devices. Students will also complete a small project. This will entail writing a proposal, purchasing parts for their controller, building the system, testing it, and writing a final report describing what they have done.
Prerequisite: ENME351 and ENME361.
Restriction: Permission of ENGR-Mechanical Engineering department.
Credit Only Granted for: ENEE461 or ENME461.

ENME462 Vibrations, Controls, and Optimization II (3 Credits)
Continuation of ENME361. Fundamentals of vibration, controls, and optimization. Analysis and design in time, Laplace and frequency domains. Mathematical descriptions of system response, system stability, control and optimization. Optimal design of mechanical systems.
Prerequisite: ENME361.
Restriction: Permission of the Mechanical Engineering Department.

ENME464 Cost Analysis for Engineers (3 Credits)
An introduction to the financial and cost analysis aspects of product engineering. Introduces key elements of traditional engineering economics including interest, present worth, depreciation, taxes, inflation, financial statement analysis, and return on investment. Provides an introduction to cost modeling as it applies to product manufacturing and support. Cost modeling topics will include: manufacturing cost analysis, life-cycle cost modeling (reliability and warranty), and cost of ownership.
Prerequisite: ENME392; or students who have taken courses with comparable content may contact the department.
Restriction: Permission of ENGR-Mechanical Engineering department.

ENME465 Probability-Based Design (3 Credits)
Review of probabilistic distributions, introduction to pseudo-random number generation, and algorithms to produce probability distributions using Monte Carlo simulation via Matlab and other approaches to best design probabilistic engineering problems.
Prerequisite: MATH206 and ENME392.
Restriction: Permission of ENGR-Mechanical Engineering department.

ENME466 Lean Six Sigma (3 Credits)
This course intends to provide in-depth understanding of Lean Six Sigma and its Define - Mearsure - Analyze - Improve - Control (DMAIC) Breakthrough Improvement Strategy. The emphasis is placed on the DMAIC process which is reinforced via application of semester long corporate projects and case study analysis.
Corequisite: ENME392; or students who have taken courses with comparable content may contact the department.
Restriction: Permission of ENGR-Mechanical Engineering department.

ENME467 Engineering for Social Change (3 Credits)
Critical analysis of issues at the intersection of engineering, philanthropy and social change. How engineering design, products and processes have created social change in the past and will do so in the future through both intended and unintended consequences. Topics covered include energy, sustainability and climate change, autonomy, the digital future, low cost engineering, manufacturing, philanthropy, ethics and the impact of electronics on society, among others. Faculty and external experts will engage with students on these topics. Students will broadly engage with organizations involved in using technology for positive social impact.
Cross-listed with: ENES467.
Restriction: Junior standing or higher.
Credit Only Granted for: ENES467 or ENME467.
Additional Information: Students in the Mechanical Engineering (ENME) major should register for ENME467, all other majors should register under ENES467.

ENME470 Finite Element Analysis (3 Credits)
Basic concepts of the theory of the finite element method. Applications in solid mechanics and heat transfer.
Restriction: Senior standing; and permission of ENGR-Mechanical Engineering department.

ENME472 Integrated Product and Process Development (3 Credits)
Integration of product development with the development process. Design strategies. Product architecture. Design for manufacturing. Selection of materials. Design for assembly.
Prerequisite: ENME331, ENME361, ENME351, and ENME371; and must have completed or be concurrently enrolled in ENME332.
Restriction: Permission of the Department of Mechanical Engineering.

ENME473 Mechanical Fundamentals of Electronic Systems (3 Credits)
An understanding of the fundamental mechanical principles used in design of electronic devices and their integration into electronic systems will be provided. Focus will be placed on the effect of materials compatibility, thermal stress, mechanical stress, and environmental exposure on product performance, durability and cost. Both electronic devices and package assemblies will be considered. Analysis of package assemblies to understand thermal and mechanical stress effects will be emphasized through student projects.
Prerequisite: ENME351.
Jointly offered with: ENME690.
Restriction: Permission of the Department of Mechanical Engineering.
Credit Only Granted for: ENME473 or ENME690.

ENME476 Mircoelectromechanical Systems (MEMS) I (3 Credits)
Fundamentals of microelectromechanical systems (MEMS). Introduction to transducers and markets. MEMS fabrication processes and materials, including bulk micromachining, wet etching, dry etching, surface micromachining, sacrificial layers, film deposition, bonding, and non-traditional micromachining. Introduction to the relevant solid state physics, including crystal lattices, band structure, semiconductors, and doping. The laboratory covers safety, photolithography, profilometry, wet etching.
Restriction: Senior standing.
Credit Only Granted for: ENME476 or ENME489F.
Formerly: ENME489F.

ENME477 Microelectromechanical Systems (MEMS) II (3 Credits)
Fabrication of devices designed in MEMS I, including everything from mask printing through training on state-of-the-art fabrication equipment through device testing. In-depth understanding of MEMS devices and technologies, such as mechanical and electromagnetic transducers, microfluidics, and chemical sensors.
Prerequisite: ENME476.

ENME479 Selected Topics in Mechanical Engineering (1-3 Credits)
Covers current topics in mechanical engineering and related fields.
Restriction: Permission of the Department of Mechanical Engineering.
Repeatable to: 6 credits if content differs.

ENME480 Introduction to Robotics (3 Credits)
An introductory course in robotics that will educate students in the elementary concepts of robotics. The course will encompass both theory and experiments.
Prerequisite: MATH246 or ENES221; and (CMSC131, ENME202, ENAE202 or ENEE150).
Restriction: Must be in the Robotics and Autonomous Systems minor; or Permission of ENGR-Mechanical Engineering department.
Credit Only Granted for: ENME480 or ENMT380.

ENME483 Physics of Turbulent Flow (3 Credits)
Specific problems of turbulent flow including automobile and truck aerodynamics and canonical flows including pipes, jets and boundary layers that are measured and simulated to gain basic understanding of turbulence. A goal of the course is to impart the necessary background for students to be able to critically assess and most effectively employ the turbulent flow prediction codes (e.g. Fluent) that are a mainstay of how turbulence is analyzed in modern industries.
Prerequisite: ENME331.
Restriction: Permission of ENGR-Mechanical Engineering department. Jointly offered with ENME656. Credit only gran ted for: ENME483 or ENME656.

ENME484 Analysis of Turbulent Flow (3 Credits)
Relentless growth in the speed and size of supercomputers has encouraged the ever expanding use of numerical simulation in the practice of fluids engineering. For the flow past ground vehicles, in the urban grid, re-entering rockets, helicopters landing on ships at sea and countless other examples, the flow is turbulent, and simulation is becoming or will one day become the methodology of choice in analyzing and designing such technologies. The goal of this course is to give an introduction to the analysis of turbulent flow via simulation and the modeling that is used in its development. Among the questions to be considered: What can one hope to learn from flow simulation? What are the strengths of the approach and what obstacles inhibit its application? What kind of physical considerations are required in setting up simulations? How does one analyze the results of a simulation?
Prerequisite: ENME331.
Jointly offered with: ENME657.
Restriction: Permission of ENGR-Mechanical Engineering department.
Credit Only Granted for: ENME484 or ENME657.

ENME485 Industrial Artificial Intelligence (3 Credits)
Introduces students to advanced technologies such as machine learning and tools, prognostics and health management (PHM), and data-centric engineering analytics - that ultimately enable the conversion of industrial big data into decision-ready information that can be used to improve the design, the productivity and the efficiency of industrial systems.,
Prerequisite: ENME202 or equivalent, experience using Python, or permission of the instructor.
Jointly offered with: ENME691.
Restriction: Permission of ENGR-Mechanical Engineering Department.
Credit Only Granted for: ENME485 or ENME691.

ENME486 Computational Modeling, Simulation, and Interactive Visualization (3 Credits)
Creation of interactive graphic displays from the numerical simulation of mechanical engineering models. Brief description of each model provided, along with varied parameters to explore models' characteristics. Conclusions drawn from use of each interactive graphic. Mathematica language introduced and interwoven with the numerical simulation of the models, which will include: robotics and mechanisms, static response of beams, control systems, measurement systems, fluid flow, vibrations, geometric modeling, finite element analysis, and nonlinear phenomena.
Restriction: Senior standing; and permission of ENGR-Mechanical Engineering department.

ENME488 Special Problems (3 Credits)
Advanced problems in mechanical engineering with special emphasis on mathematical and experimental methods.
Restriction: Permission of ENGR-Mechanical Engineering department.
Repeatable to: 6 credits if content differs.

ENME489 Special Topics in Mechanical Engineering (3 Credits)
Selected topics of current importance in mechanical engineering.
Restriction: Permission of ENGR-Mechanical Engineering department.
Repeatable to: 6 credits.

ENMT - Mechatronics Engineering

ENMT301 Structural Dynamics (3 Credits)
An introduction to modeling and structural analysis of mechatronic structures subject to dynamic loading. It deals with preliminary analysis of primary structure for mechatronics components, including such topics as load determination, torsion, bending, shear, buckling, fatigue and thermal analysis of thin-walled structures. Emphasis is placed on solving problems by finding the differential equations of motion of model systems and solving these equations analytically or numerically in Matlab.
Prerequisite: Minimum grade of C- in ENES220.
Restriction: Must be in the Mechatronics Engineering program.

ENMT313 Real Time Software Systems and Microprocessors (3 Credits)
Timing, synchronization and data flow; parallel, serial, and analog interfaces with sensors and actuators; microprocessor system architecture; buses; direct memory access (DMA); interfacing considerations. System simulation in CAD.
Prerequisite: Minimum grade of C- in ENMT322.
Restriction: Must be in the Mechatronics Engineering program.

ENMT322 Discrete Signal Analysis (3 Credits)
Analysis techniques for simulating resonances and impedances in systems that couple physical interactions electrical, mechanical, magnetic and piezoelectric domains. Analysis applied to modeling the electro-magneto-mechano-acoustic domain interactions in traditional loudspeaker designs, and can be extended to the design of sensors, energy harvesters and actuators.
Prerequisite: Minimum grade of C- in MATH246.
Restriction: Must be in the Mechatronics Engineering program.

ENMT332 Classical Control Theory (3 Credits)
An introduction to the feedback control of dynamic systems. Laplace transforms and transfer function techniques; frequency response and Bode diagrams. Stability analysis via root locus and Nyquist techniques. Performance specifications in time and frequency domains, and design of compensation strategies to meet performance goals.
Prerequisite: Minimum grade of C- in ENMT301.
Restriction: Must be in the Mechatronics Engineering program.

ENMT361 Mechatronics and Controls I (3 Credits)
Basic instrumentation electronics including DC electronics, AC electronics, semiconductors, electro-optics and digital electronics. Sensing devices used to carry out experiments including meteorology, machine tool measurements, bridge circuits, optical devices, and introduction to computer based data acquisition.
Prerequisite: Minimum grade of C- in PHYS270 and PHYS271.
Restriction: Must be in the Mechatronics Engineering program.

ENMT362 Mechatronics and Controls Lab II (3 Credits)
Focuses on designing mechanical motion transmission systems, including gearing, couplings, belts, and lead screws. Students will learn to measure and sense mechanical motion while selecting appropriate sensors and electromechanical actuators. Topics include programmable logic controllers (PLCs), sequential controller design, and digital input/output systems. Practical applications and case studies provide hands-on experience in integrating these components into functional systems.
Prerequisite: Minimum grade of C- in ENMT361.
Restriction: Must be in the Mechatronics Engineering program.

ENMT372 Robotic Systems (3 Credits)
General domain knowledge. Manipulators, rovers, flight vehicles/quadcopters. Constraint considerations and analysis. Introduces the Robot Operating System (ROS) framework.
Prerequisite: Minimum grade of C- in ENMT380.
Restriction: Must be in the Mechatronics Engineering program.

ENMT380 Intro to Robotics (3 Credits)
Introduces basic concepts for deployment of robotic systems in mechatronics. This course will introduce students to the elementary concepts in robotics, with emphasis on robotic manipulators. It will encompass both theory and laboratory components with programming on real manipulators.
Prerequisite: Minimum grade of C- in ENME202 or ENAE202; and minimum grade of C- in ENES221 and MATH246.
Restriction: Must be in the Mechatronics Engineering program.
Credit Only Granted for: ENMT380 or ENME480.

ENMT450 Robotics Programming (3 Credits)
Students continue to work within the Robot Operating System (ROS) as well as with many of the available tools commonly used in robotics. Lectures focus on theory and structure, whereas laboratory sections will focus on applications and implementations. Students learn how to create software and simulations, interface to sensors and actuators, and integrate control algorithms. Topics include ROS architecture, console commands, ROS packages, simulation environments, visualizations, autonomous navigation, manipulation, and robot vision.
Prerequisite: ENMT322.

ENMT471 Advanced Manufacturing and Automation (3 Credits)
Introduction to manufacturing processes and the methods for automating them. Introduces computer-aided design to model parts and assemblies. Theory and practice of additive and subtractive manufacturing processes. Introduction to composite materials. Integrating automated machining into factories.
Prerequisite: Minimum grade of C- in ENMT372.
Restriction: Must be in the Mechatronics Engineering program.
Credit Only Granted for: ENMT471 or ENMT487.
Formerly: ENMT487.

ENMT473 Motion Planning for Autonomous Systems (3 Credits)
Autonomous systems (e.g., aircraft, vehicles, manipulators, and robots) must plan long-term movement that respects environmental constraints such as obstacles, other actors, and wind; system constraints such as kinematics, dynamics, and fuel; as well as factors such as time and safety. Robust autonomy also requires dealing with environmental changes, new information, and uncertainty. This course provides an overview of such problems and the methods used to solve them.
Prerequisite: ENMT332.
Restriction: Must be in the Mechatronics Engineering program at the Universities at Shady Grove.

ENMT477 Machine Learning in Mechatronics Engineering (3 Credits)
Machine learning (ML) principles along with their application to mechatronic systems are introduced. Different ML paradigms, such as supervised, unsupervised, and reinforcement learning are covered. Topics include data pre-processing and feature engineering, linear and polynomial regression, anomaly detection, deep learning for computer vision, and reinforcement learning. Students learn to model, control, and optimize mechatronic systems using ML models through weekly labs, programming assignments, and a hands-on final project.
Restriction: Must be in the Mechatronics Engineering program.

ENMT483 Mechatronic Systems I (3 Credits)
Covers the principles of mechatronic systems analysis and design. Students will learn performance analysis and optimization, design of systems including avionics, power, propulsion, human factors, structures, actuators and mechanisms, and thermal control. The course will also cover design processes and design synthesis. The course will conclude with students applying what they have learned so far with a project in mechatronic systems design.
Prerequisite: ENMT362.
Restriction: Must be in the Mechatronics Engineering degree program at the Universities at Shady Grove.

ENMT484 Mechatronic Systems II (3 Credits)
Covers the principles of mechatronic systems analysis and design. Students will learn performance analysis and optimization, design of systems including avionics, power, propulsion, human factors, structures, actuators and mechanisms, and thermal control. The course will also cover design processes and design synthesis. The course will conclude with students applying what they have learned so far with a project in mechatronic systems design.
Prerequisite: Minimum grade of C- in ENMT380, ENMT362, and ENMT483.
Restriction: Must be in the Mechatronics Engineering program.

ENMT488 Topics in Mechatronics Engineering (1-4 Credits)
Technical elective taken with the permission of the student's advisor and instructor. Lecture and conference courses designed to extend the student's understanding of mechatronics engineering. Current topics are emphasized.
Restriction: Permission of Mechatronics Engineering program at Shady Grove.
Repeatable to: 6 credits if content differs.

ENMT499 Elective Research (3 Credits)
Independent research in the Department of Mechatronics Engineering
Restriction: Permission of department required.
Repeatable to: 6 credits.

ENRE - Reliability Engineering

ENRE447 Fundamentals of Reliability Engineering (3 Credits)
Provides a general survey of the techniques of reliability engineering with a focus on theoretical basis and quantitative methods, with frequent examples of application. Topics include mathematical definition of reliability, probabilistic models to represent failure phenomena, statistical life models for non-repairable components, reliability data analysis, failure modes and effects analysis, risk analysis, and system reliability models including fault trees, event trees. Students will learn how to apply these techniques to problems related to engineering systems, with example cases for process plants, energy systems and infrastructure.
Prerequisite: Minimum grade of C- in MATH141 and MATH246.
Restriction: Must be a student in the Clark School of Engineering.
Additional Information: Questions about permission for the course should be directed to enmeundergrad@umd.edu.

ENRE489 Special Topics in Reliability Engineering (3 Credits)
Selected topics of current importance in reliability engineering.
Prerequisite: Permission of ENGR-Mechanical Engineering department.
Repeatable to: 6 credits if content differs.

ENSP - Environmental Science and Policy

ENSP101 Introduction to Environmental Science (3 Credits)
One of two required courses that introduce students to the topics studied and methods employed in environmental science and policy. Emphasis on scientific ways of knowing; the systems, cycles, flows, and interfaces that characterize the atmosphere, lithosphere, hydrosphere, and biosphere; the analysis of human impacts on these systems; and the nature of scientific uncertainty and methods of quantifying environmental processes.

ENSP102 Introduction to Environmental Policy (3 Credits)
Second of two courses that introduce students to the topics studied and methods employed in environmental science and policy. Emphasis on the process of formulating, implementing, and evaluating policy responses to environmental problems, with particular attention to policy controversies related to scientific uncertainty, risk assessment, the valuation of nature, and distributional equity. May be taken before or after ENSP101.
Additional Information: May be taken before or after ENSP101.

ENSP250 Lawns in the Landscape: Environmental Hero or Villain? (3 Credits)
Examination of the lawn as an element in the anthropogenic landscape and its influence on global warming, regional air and water quality, ecological diversity, mammalian pesticide exposure and consumptive water use. Demographic and socioeconomic factors are examined in the context of being predictors of landscape aesthetic desires and lawn management behaviors. Policies that incentivize lawn alternatives or changes in lawn management behavior are discussed.Cross-listed with PLSC250.
Credit Only Granted for: ENSP250 or PLSC250.

ENSP305 Applied Spatial Analysis in Environmental Science and Policy (3 Credits)
Intended for students interested in pursuing career or graduate research opportunities that will include identifying/querying/processing environmental datasets, detailed spatial analysis of environmental data, and applications of predictive environmental modeling. Students will learn necessary skills to analyze and process environmental data through hands-on training in commonly used software and a series of topical case studies. Data analysis and data processing will be taught using publicly available real-world environmental data sets.
Prerequisite: GEOG373; or permission of Environmental Science and Policy Program.
Recommended: ENSP101 and ENSP102.
Restriction: Must have earned a minimum of 60 credits; and permission of Environmental Science and Policy program.

ENSP306 Fundamentals of Qualitative Research Methods for Environmental Studies (3 Credits)
An introduction to research design and methods, with an in-depth focus on qualitative research methods and application to environmental studies. Topics include: writing an appropriate research question, identifying relevant methods, submitting a proposal to the Institutional Review Board, choosing appropriate sampling approaches, conducting interviews, focus groups, ethnographies, analyzing textual data, and presenting qualitative results.
Recommended: ENSP101 and ENSP102.
Restriction: Junior standing or higher; and must be a major in the Environmental Science and Policy program; or permission of Environmental Science and Policy program.

ENSP330 Introduction to Environmental Law (3 Credits)
An overview of environmental law, from its common law roots to its role in the modern regulatory state, including an examination of major federal environment statutes and the policy debates inherent in them. Other areas covered include civil and criminal enforcement, standing to sue, land use control, and regulatory takings.
Recommended: ENSP101 and ENSP102.
Restriction: Junior standing or higher. And must be a major in the Environmental Science and Policy program; or permission of Environmental Science and Policy program.

ENSP340 Water: Science, Ethics, and Policy (3 Credits)
Exploration of the science, policy, and ethical aspects of water resource protection and management. Focus on water pollution, water availability, ecosystems, and sustainability
Recommended: ENSP101 and ENSP102.
Restriction: Must have earned a minimum of 60 credits. And must be a major in the Environmental Science and Policy program; or permission of Environmental Science and Policy program.

ENSP342 Environmental Threats to Oceans and Coasts: Towards an Integrated Policy Response (3 Credits)
An interdisciplinary study of the challenges of maintaining the health and vitality of oceans and coasts in the face of climate change, extreme weather, and other threats including pollution, and oil and gas development. Exploration of four broad themes: resource management, conservation and stewardship, pollution, and coastal zone management. Also, an analysis of current efforts to integrate these themes through ecosystem-based management; marine spatial planning; and related policy responses.
Recommended: ENSP101 and ENSP102.
Restriction: Must have earned a minimum of 60 credits. And must be a major in the Environmental Science and Policy program; or permission of Environmental Science and Policy program.

ENSP350 Energy Resources: Science and Policy in the 21st Century (3 Credits)
Energy resource production and consumption, including historical context, current trends in the U.S. and globally, and social and environmental implications. Includes fuel-source formation, history of use, modern trends in consumption, production, pricing and trade, reserves and resources, environmental and social impacts, future outlook and potential new technologies related to energy efficiency and conservation.
Prerequisite: ENSP101 and ENSP102.
Restriction: Must have earned a minimum of 60 credits; and permission of AGNR-Dean-Environmental Science & Policy Program.
Credit Only Granted for: ENST405, ENSP350, ENST605, or MEES698Z.

ENSP360 Every Drop Counts: Water, Food and Global Public Health (3 Credits)
In-depth interdisciplinary study of the public health issues related to water use for global food production. Topics will include accessibility and availability of safe water for agriculture worldwide, potential microbiological and chemical hazards in agricultural water, alternative water sources such as reclaimed wastewater and return flows, food safety approaches to managing agricultural water, and agricultural influences on surface and groundwater quality. Political, social, and economic factors relating to agricultural water will be addressed, with special focus on regions that are leaders in innovative water management and regions where access to clean water for agriculture is a major challenge.
Prerequisite: ENSP101 or MIEH300; or permission of department.
Cross-listed with: MIEH333.
Credit Only Granted for: MIEH333 or ENSP360.

ENSP370 Principles of Environmental Justice: Theory and Practice (3 Credits)
Explores the issue of environmental justice from the social science, policy, and legal perspectives. The course will begin with a theoretical foundation of environmental justice, and the historical, social and economic roots of environmental injustices and environmental racism. We will explore the different contexts within which environmental injustice manifests itself including domestic and international examples such as injustices in the food system, climate justice, environmental privilege, and urban environmental justice and pollution. We will study the ways in which people and communities have combated environmental injustices by looking at the history of the environmental justice movement, which was created to address the increasingly disproportionate impacts of environmental harms on low income populations and communities of color.
Recommended: ENSP101 and ENSP102.
Restriction: Junior standing or higher. Must be a major in the Environmental Science and Policy program; permission of Environmental Science and Policy program.

ENSP386 Internship (3-6 Credits)
Restriction: Must have internship proposal approved by the concentration advisor, the director of ENSP and the student's internship sponsor.

ENSP399 Special Topics in Environmental Science and Policy (1-3 Credits)
A substantive and specialized examination of contemporary issues in environmental science or policy.
Restriction: Must be in Environmental Science and Policy program; or permission of AGNR-Dean-Environmental Science & Policy Program.
Repeatable to: 12 credits if content differs.

ENSP400 Capstone in Environmental Science and Policy (3 Credits)
Integration of physical, biological, and social sciences with applications to environmental science and policy. Problem-solving and multi-disciplinary case study evaluations pertinent to contemporary and future issues related to the environment.
Prerequisite: ENSP101; and ENSP102.
Restriction: Must be in Environmental Science and Policy program; and senior standing; and permission of the Environmental Science and Policy Program.

ENSP489 Special Topics in Environmental Science and Policy (1-3 Credits)
A lecture and or laboratory series organized to study a selected phase of Environmental Science and Policy not covered by existing courses. Credit according to time scheduled and organization of the course.
Repeatable to: 6 credits if content differs.

ENSP499 Honors Thesis Research (1-6 Credits)
Individual research, thesis, and oral defense. The research project will be conducted under the supervision of a faculty member.
Restriction: Must be in the ENSP Honors program; and permission of AGNR-Dean-Environmental Science & Policy Program.
Repeatable to: 6 credits.

ENST - Environmental Science and Technology

ENST100 International Crop Production-Issues and Challenges in the 21st Century (3 Credits)
Examines the role of crop production in elevating humans out of poverty in developing countries. It will introduce students to the basic principles of plant and soil science underlying the international production of food crops and world food security. The role of multinational agencies such as the World Bank in the promotion of sustainable crop production using environmentally-sound technologies will also be discussed.

ENST101 Ecological Discovery and Natural Solutions (1 Credit)
The UMD Environmental Science and Technology (ENST) Department seeks to develop and apply scientific tools and processes to advance solutions to some of society's greatest environmental challenges. This seminar provides a unique and exciting opportunity to learn directly from faculty and researchers in the Department about what they study, teach, and share with society. Students will learn about the wide variety of research being conducted in the Department and how it relates to potential solutions to current environmental challenges. The course will cover research in the following areas: urban green spaces, aquaponics, bioenergy, wildlife management, aquatic toxicology, urban green spaces, wetland restoration, water resources, ecosystem health, soil chemistry, and more. It is anticipated that the course will include short visits to ENST laboratories and facilities. The course will also include information about academic, internship, and career opportunities related to ENST.
Credit Only Granted for: ENST499K or ENST101.
Formerly: ENST499K.

ENST111 Field Exploration in Environmental Science and Technology (4 Credits)
Immerse yourself in the diverse aspects of the Environmental Science and Technology Department (ENST) with the Field Exploration in Environmental Science and Technology course. In this hands-on course, both the outdoors and the laboratory serve as your classroom. You will travel by foot, bus, and boat to a variety of ecosystems, from forests and wetlands to urban rivers and the open Bay. Along the way, you will explore many of the ecological challenges posed by human activities. Under expert guidance, you will learn and apply field methods and laboratory techniques, gaining a deeper understanding of how environmental scientists address humanity's grand challenges through scientific data collection and analysis. Each field experience, corresponding discussion, and laboratory analysis is designed to enhance your ecological literacy by engaging directly with the environment and the professionals working to understand and protect it.
Restriction: Must be in the Environmental Science and Technology program; or by permission of the Environmental Science and Technology department.

ENST115 Bats in Society: Human-Wildlife Relationships, Conflicts, & Solutions (3 Credits)
How might an understanding of human-wildlife conflicts shape our approach to disease, ecology, and conservation? Should we care that we are losing wildlife, like bats? Across the globe, human societies have significantly harmed bat populations both intentionally and unintentionally. This course will delve into different bat population crisis causes as well as current and potential solutions, while addressing complex human-wildlife conflicts that need to be considered while solving them. During the course, students will get hands-on experience using highly sophisticated bat acoustic technology to identify bats to species-level. Lecture and discussion sections will focus on bat ecology, management techniques, newest bat identification techniques, data interpretation, and scientific presentation skills.
Credit Only Granted for: ENST115 or ENST215.
Formerly: ENST215.
Additional Information: Students should expect to spend 1-3 hours across multiple nights deploying bat detectors (which will be provided by the instructor) at a location of their choosing. Safety protocols will be discussed and implemented.

ENST200 Fundamentals of Soil Science (4 Credits)
Study and management of soils as natural bodies, media for plant growth, and ecosystem components. Morphology, composition, formation, and conservation of soils. Chemical, biological, and physical properties are discussed in relation to the production of plants, the functioning of hydrologic and nutrient cycles, the protection of environmental quality, and engineering uses of soils.
Corequisite: CHEM131 and CHEM132; or permission of AGNR-Environmental Science & Technology department.
Credit Only Granted for: ENST200 or NRSC200.
Formerly: NRSC200.

ENST214 Introduction to Natural Resources Management (3 Credits)
Lectures, discussion, and readings in social, biological, and human dimension issues facing natural resource managers in the United States. Coverage will include history and philosophical discussions of fishery, wildlife, and forestry sciences; conservation and management; principles of community, habitat, and animal ecology and management; and interrelations of wildlife, fish, and forestry.
Prerequisite: BSCI160 and BSCI161; or permission of instructor.
Restriction: Must be in the ENST Natural Resources Management or ENSP Wildlife Ecology & Management programs; and must have completed less than 90 credits; or permission of instructor.

ENST220 Can Soil Be a Climate Solution? (3 Credits)
Can soil help mitigate climate change? The top 30 cm of soil stores twice as much carbon as the atmosphere and more than all of Earth's vegetation combined. Understanding how soil captures and retains carbon is essential to reversing global warming trends. This course explores the vital role soils play not only in food production but also in climate change mitigation. Through lectures, discussions, field trips, and literature-based research, students will examine the drivers of climate change, key soil properties, and sustainable soil management practices that can help reduce atmospheric carbon and prevent the worst impacts of climate change.
Credit Only Granted for: HNUH248W or ENST220.
Formerly: HNUH248W.

ENST233 Introduction to Environmental Health (4 Credits)
Examines how humans are affected by the quality of our air, water, soil and food supply as well as how human activities alter these survival necessities. Students will learn how the evolution and prosperity of human populations have resulted in degradation of our environment and the impact of environmental degradation on the health of people. The implications of individual and collective choices for sustainable food production, population management, and resource utilization will be explored.

ENST252 Wildlife Diseases (3 Credits)
Covers the identification and investigation of wildlife diseases, primarily in North America. The course will focus on mammalian, avian, amphibian, reptilian, and some aquatic wildlife, as well as the principles of disease investigation. Attention will be given to the following categories: etiology/causative agents, signs, animal hosts, geographic region, seasonality, means of transmission, pathology, human health/zoonotic risk, economic impacts, prevention, control, and effects of the disease on the population of the species involved. This course will present these topics in a manner appropriate for students from multiple disciplines. Occasionally, it will use experts in wildlife disease and management to provide students with opportunities to interact with veterinarians, biologists, and researchers in zoo and wildlife disease management.
Credit Only Granted for: ENST252 or ANSC252.

ENST281 Computer Aided Design in Ecology (2 Credits)
Basics of Computer Aided Drawing (CAD) applied to design of constructed ecosystems. Use of campus stormwater wetland as case study.

ENST282 Ecological Innovation and Entrepreneurship (3 Credits)
Ecotechnology innovation is taught with design thinking, which uses an iterative cycle of developing customer empathy, learning ecological technology, appreciating environmental stewardship, brainstorming, rapid prototyping, user experience, testing and redesign. Environment entrepreneurship is based on the Lean Startup process, which uses customer discovery, encourages quick product development, reduces start-up costs, tests ideas quickly, and employs designed experiments. A multidisciplinary academic setting embraces designing, building, testing and marketing novel technologies that enhance the environmental needs of humans. Students will learn in an active environment that requires working creatively, collaboratively, diligently, and precisely to create a business model and tangible prototype for a new commercial product.

ENST283 Artificial Intelligence for Environmental Good (3 Credits)
Explore the exciting world of generative AI to tackle real-world environmental challenges. This course blends science, ethics, and practical skills. You will learn the science and ethics of large language models, like ChatGPT, master cutting-edge AI skills, apply them to analyze a practical and complex environmental problem so you can develop a nature-based solution, all while working in a supportive, collaborative setting.
Credit Only Granted for: ENST499E or ENST283.
Formerly: ENST499E.

ENST301 Field Soil Morphology I (1 Credit)
This is a field-oriented course that introduces students to the techniques used to (1) describe soil morphology, and site and profile characteristics, (2) make land use interpretations based on soil characteristics, and (3) classify soils. This class is designed to prepare students for the Regional Collegiate Soil Judging Contest and for students to gain experience in the description and interpretation of soils in the field.
Restriction: Permission of AGNR-Environmental Science & Technology department.
Formerly: ENST308.

ENST302 Field Soil Morphology II (1 Credit)
This is the second field-oriented course in a three course sequence that provides intermediate training for students in the techniques used to (1) describe soil morphology, and site and profile characteristics, (2) make land use interpretations based on soil characteristics, and (3) classify soils. This class is designed to prepare students for the Regional Collegiate Soil Judging Contest and for students to gain experience in the description and interpretation of soils in the field.
Prerequisite: ENST301.
Restriction: Permission of AGNR-Environmental Science & Technology department.

ENST303 Field Soil Morphology III (1 Credit)
This is the third field-oriented course in a three course sequence that provides intermediate training for students in the techniques used to (1) describe soil morphology, and site and profile characteristics, (2) make land use interpretations based on soil characteristics, and (3) classify soils. This class is designed to prepare students for the Regional Collegiate Soil Judging Contest and for students to gain experience in the description and interpretation of soils in the field.
Prerequisite: ENST302.
Restriction: Permission of AGNR-Environmental Science & Technology department.

ENST309 Advanced Field Soil Morphology (1 Credit)
This is a field-oriented course that provides advanced training for students in the techniques used to (1) describe soil morphology, and site and profile characteristics, (2) make land use interpretations based on soil characteristics, and (3) classify soils. This class is designed to prepare students for the National Collegiate Soil Judging Contest and for students to gain experience in the description and interpretation of soils in the field. Students will be exposed to a variety of soil landscapes and geology from outside of the northeastern U.S.
Prerequisite: ENST301.
Restriction: Permission of AGNR-Environmental Science & Technology department.
Repeatable to: 3 credits if content differs.

ENST321 Statistics for Environmental Scientists (3 Credits)
Introduces students to statistical methods used in environmental science to analyze, interpret, and communicate data related to environmental science. The course emphasizes solving problems and independent learning and inquiry. Students will learn key concepts in descriptive and inferential statistics, probability distributions, hypothesis testing, regression modeling, and time series analysis. The course also covers advanced topics such as model selection and spatial data analysis. Hands-on exercises using real-world environmental datasets and statistical software (R) will provide students with practical skills in data visualization, analysis, and decision-making. By the end of the course, students will be equipped to critically evaluate environmental data and apply statistical tools to address pressing environmental challenges.
Prerequisite: MATH115.
Restriction: Must be in the Environmental Science and Technology program; or permission of the Environmental Science and Technology department.

ENST333 Ecosystem Health and Protection (3 Credits)
Discussion of the philosophies, principles, and practices for assessing ecosystem health with emphasis on an ecosystem perspective rather than a human health perspective. Degradation associated with human activities will be emphasized. Topics will range from local to regional to global issues, including a discussion on global warming and its possible impacts on ecosystems. Concepts will be clarified using case histories from the Chesapeake Bay watershed.
Prerequisite: ENST233 or permission of instructor.

ENST334 Environmental Toxicology (3 Credits)
Concepts and case histories in ecotoxicology. Emphasis on origin and variety of environmental pollutants, routes of biological exposure, modes of toxicological action and effects on individual organisms, populations and ecosystems. Ecotoxicological issues in the Chesapeake Bay will be used as examples.
Prerequisite: CHEM131, CHEM132, and BSCI207; or permission of AGNR-Environmental Science & Technology department.

ENST344 Principles of Aquaponics: The Circular Food Production System (3 Credits)
In the last few years, aquaponics has attracted a lot of attention around the globe, especially in the context of urban farming. This course addresses the question: how does an aquaponics system work and what knowledge is needed to successfully run an aquaponic system? The different parts of this course will give the students an understanding of important topics in the field of aquaponics and develop a broad knowledge base: from water chemistry, fish and plant physiology, to engineering and microbiology and show them how to plan and design such a sustainable production system. Aquaponics is a technique that combines aquaculture (fish farming) and hydroponics (soil-less plant cultivation) in a circulatory system with the aim of recycling nutrients from fish farming wastewater. Also, aquaponics can serve as a learning model for inter-and transdisciplinary thinking and acting.
Prerequisite: BSCI160 or BSCI170; and CHEM131 or CHEM135.
Credit Only Granted for: ENST499O or ENST344.
Formerly: ENST499O.

ENST360 Ecosystem Ecology (4 Credits)
The study of ecology has a long and interesting history, from early society's efforts to understand and alter their environment as a matter of survival to the challenges the modern world is facing that are global in scale. Through the course text, distributed supplemental chapter readings and an understanding of the scientific literature, this course will cover the essential concepts and principles of ecosystem ecology as well as its history and past and present controversies. Several of the basic methods and tools of field research and the applied management of ecosystems will be discussed and demonstrated with several field excursions in the natural environs of the DC area. Central to this course will be the understanding that modern human society is an integral part of nature, with the power to impact and influence elements of the natural world at multiple scales. An analysis of policy implications for the biosphere will be discussed.
Prerequisite: BSCI160 and BSCI161; or BSCI106.
Restriction: Must be in the Environmental Science and Technology major; or permission of instructor.

ENST361 Urban Environmental Science (3 Credits)
Urban Environmental Science is an interdisciplinary subject at the intersection of social, environmental, and economic systems. This course will examine ecology in the city (i.e. why do certain species live in certain greenspaces?), ecology of the city (i.e. how do urban ecological processes influence the health and safety of human residents?), and ecology for the city (i.e. how do we plan and restore greenspaces in a just way so that all residents have equitable access to nature?). This course will have a strong focus on natural systems within urban ecosystems. Each topic will focus on key urban ecological concepts and then explore how these topics apply to urban planning and design. The course will be a mix of traditional lectures, class discussions, and field trips to see urban environments in action in Washington, D.C.
Credit Only Granted for: ENST499A or ENST361.
Formerly: ENST499A.

ENST373 Natural History of the Chesapeake Bay (3 Credits)
Consideration of the major groups of organisms associated with the Chesapeake Bay and current issues that determine humans' present and future uses for the Chesapeake and its biota.
Cross-listed with: BSCI373.
Credit Only Granted for: BSCI373 or ENST373.

ENST379 Environmental Science and Technology Undergraduate Teaching Assistant (1-3 Credits)
A weekly teaching practicum and concurrent internship as an undergraduate teaching assistant in an Environmental Science and Technology course. By exploring the theories and best practices of teaching and learning in the various fields of environmental science, students will acquire foundational skills and knowledge for effective college teaching. Essential topics include teaching methods, classroom management, student engagement, and the basics of course design with emphasis placed on understanding diverse student needs, promoting inclusive teaching practices, and fostering critical thinking. Through interactive activities and peer & instructor feedback, students will gain hands-on experience in creating positive and impactful learning environments.
Restriction: Permission of the Environmental Science and Technology department; and permission of instructor; and must be in the Environmental Science and Technology program.
Repeatable to: 6 credits.
Additional Information: Students should have taken the course for which they will TA.

ENST388 Honors Thesis Research (3-6 Credits)
Undergraduate honors thesis research conducted under the direction of an AGNR faculty member in partial fulfillment of the requirements of the College of AGNR Honors Program. The thesis will be defended to a faculty committee.
Restriction: Permission of AGNR-Environmental Science & Technology department.
Repeatable to: 6 credits if content differs.

ENST389 Internship (3 Credits)
Credit will be granted for practical work carried out by students placed in work environment related to their stated career goals. Students must do an in-depth study in some portion of the work experience and produce a special project or report related to this study. A student work log is also recommended. An evaluation from the external supervisor of the project will be required. Credit arranged with supervising faculty member.
Restriction: Must be in Environmental Sci & Tech program.
Repeatable to: 6 credits if content differs.

ENST403 Invasive Species Ecology (3 Credits)
We will examine ecological, evolutionary, and anthropogenic processes facilitating or resisting biological invasions, and consider their environmental, economic, and human health impacts. We will consider various management strategies to mitigate invasions and identify areas of future research. Field trips and detailed discussion of recent findings and controversies in the literature will help illustrate fundamental concepts of invasions among various ecosystems.
Credit Only Granted for: ENST403, ENST603, or ENST689R.

ENST404 Ecological and Natural Resources Ethics (3 Credits)
Bridges science and management with ethical theory and concepts to help scientists, regulators, and managers understand how to deal with potential ethical dilemmas that arise in natural resource and environmental management implementation and policy development.
Prerequisite: ENST214 and ENST360.
Recommended: ENST314, ENST410, and ENST460.
Restriction: Senior standing or higher. Jointly offered with ENST604.
Credit Only Granted for: ENST604 or ENST404.

ENST405 Energy and Environment (3 Credits)
Introduction to the role of energy in environmental and human-dominated systems. Discussion of the historical and modern production and consumption of energy. Introduction to energy systems computer simulation and energy auditing.
Prerequisite: MATH140 or MATH120; or must have completed MATH220.
Restriction: Junior standing or higher. And must be in Environmental Sci & Tech program; or must be in Environmental Sci & Tech: Ecological Tech Design program; or must be in Environmental Sci & Tech: Environmental Health program; or must be in Environmental Sci & Tech: Soil & Watershed Science program; or must be in Environmental Sci & Tech: Natural Resources Mgmt program. Jointly offered with ENST605.
Credit Only Granted for: ENST405, ENSP350, ENST605, or MEES698Z.

ENST410 Ecosystem Services: An Integrated Analysis (3 Credits)
The importance of our ecosystems and the services they provide will be discussed. Basic principles used to analyze ecosystem services will be discussed and applied using case studies & field exercises. Forestland, wetlands and our marine resources are increasingly recognized for their ecosystem services provided to society, to include clean air and water, wildlife habitat, biodiversity, carbon storage and pollination services. This course will prepare students to deal with the complex issues involved in understanding those and other ecosystem services and their importance to society and environmental sustainability. Slowly, new markets are emerging for these services. Students will analyze the ecological, policy and financial dimensions of enhancing, restoring, and sustaining ecosystem services. New and on-going government programs and private business ventures will be discussed.
Prerequisite: ENST360 or BSCI361; or permission of instructor.
Restriction: Must be in one of the following programs (Environmental Sci & Tech: Ecological Tech Design; Environmental Sci & Tech; Environmental Sci & Tech: Natural Resources Mgmt; Environmental Sci & Tech: Soil & Watershed Science; Environmental Sci & Tech: Environmental Health).

ENST411 Principles of Soil Fertility (3 Credits)
Soil factors affecting plant growth and quality with emphasis on the bio-availability of mineral nutrients. The management of soil systems to enhance plant growth by means of crop rotations, microbial activities, and use of organic and inorganic amendments.
Prerequisite: ENST200; or students who have taken courses with comparable content may contact the department. Jointly offered with ENS T611.
Credit Only Granted for: ENST411 or NRSC411.
Formerly: NRS C411.

ENST414 Soil Morphology, Genesis and Classification (4 Credits)
Processes and factors of soil genesis. Taxonomy of soils of the world by U.S. System. Soil morphological characteristics, composition, classification, survey and field trips to examine and describe soils.
Prerequisite: Must have completed or be concurrently enrolled in ENST200.

ENST415 Renewable Energy (3 Credits)
An overview of renewable energy technologies and their current applications. Emphasis will be placed on technological readiness, efficiency and sustainability of renewable energy alternatives. Technologies include solar thermal, photovoltaics, biodiesel, ethanol, anaerobic digestion, wind, hydroelectric, and microbial fuel cells.
Prerequisite: CHEM131, PHYS121, and MATH113; or permission of AGNR-Environmental Science & Technology department.

ENST417 Soil Hydrology and Physics (3 Credits)
A study of soil water interactions: the hydrologic cycle; the unique properties of water and soil; the soil components and their interactions; the field water cycle; transport processes involving water, heat and solutes; human effects on soil and groundwater; as well as the measurement, prediction, and control of the physical processes taking place in and through the soil.
Prerequisite: ENST200; and (MATH113 or MATH115).

ENST421 Soil Chemistry (4 Credits)
The chemistry and composition of mineral and organic colloids in soils, including ion exchange, oxidation-reduction, acidity, surface charge, and solution chemistry. Lectures and readings pertain to plant nutrition, waste disposal, and groundwater quality.
Prerequisite: ENST200.

ENST422 Soil Microbial Ecology (3 Credits)
The interdisciplinary study of soil microorganisms and their interactions with the mineral matrix; resulting in processes such as nutrient cycling, decontamination, and natural product production. We will focus on the diversity of soil communities, their survival strategies, and the new strategies used to study these communities.
Prerequisite: ENST200; or 1 course in BCHM; or must have completed a course in microbiology; or students who have taken courses with comparable content may contact the department.
Jointly offered with: ENST622.

ENST423 Soil-Water Pollution (3 Credits)
Reaction and fate of pesticides, agricultural fertilizers, industrial and animal wastes in soil and water with emphasis on their relation to the environment.
Prerequisite: CHEM131 and CHEM132; or permission of instructor.

ENST430 Wetland Soils (3 Credits)
The soils of wetlands including hydrology, chemistry, and genesis are discussed. Federal and regional guidelines for wetland soils are covered with an emphasis on validating interpretations through field observations.
Prerequisite: ENST200.
Credit Only Granted for: ENST430 or ENST630.

ENST432 Environmental Microbiology (3 Credits)
Microorganisms are everywhere and mediate many of the processes that we observe everyday. These organisms are the unseen catalysts for numerous industrial processes and are critical to many emerging technologies and novel products. Environmental microbiologists ask: How do microorganisms in the environment benefit society? This course will answer this question by examining microbes in bioremediation, food safety, climate change, and biotechnology.
Prerequisite: CHEM131 and CHEM132.

ENST434 Toxic Contaminants: Sources, Fate, and Effects (3 Credits)
Study of the release to the environment, transport through natural compartments, persistence and ultimate fate of various classes of contaminants produced as a result of human activities. Topics will culminate in discussions of impacts to wildlife and human health. Students should emerge with a practical appreciation of the actual risks from exposure to a variety of environmental contaminants and an understanding of the environmental and human health implications of continuing the contaminating activities.
Prerequisite: ENST333 and ENST334.

ENST436 Emerging Environmental Threats (3 Credits)
Examine new and potential environmental concerns in the air, water, soil, space, and the built environment. Emphasis on studying the intrinsic links between ecosystem and human health. Topics will include climate change, resource consumption, biodiversity change, infectious disease, non-traditional pollutants, and other complex and significant environmental concerns.
Prerequisite: ENST233; or permission of AGNR-Environmental Science & Technology department.

ENST441 Sustainable Agriculture (3 Credits)
Environmental, social and economic needs for alternatives to the conventional, high-input farming systems which currently predominate in industrial countries. Strategies and practices that minimize the use of non-renewable resources.

ENST445 Ecological Risk Assessment (3 Credits)
Assessment of ecological impacts of perturbations on natural systems. Course will describe methods for estimating environmental impacts including extrapolating from laboratory and field data. The role of regulatory agencies and implications of scientific uncertainty on risk management will be covered.
Prerequisite: ENST360 or BSCI361; and (BIOM301 and ENST334).

ENST450 Wetland Ecology (3 Credits)
Plant and animal communities, biogeochemistry, and ecosystem properties of wetlands. Lectures are supplemented by field trips and in-class labs. Hands-on activities include identification of wetland plant species, wetland delineation, and collection and analysis of field data on wetland vegetation, soil, and hydrology. Wading boots (at least hip length) are strongly recommended.
Prerequisite: BIOM301 and ENST360, or equivalent courses in data analysis and ecology; or permission of AGNR-Environmental Science & Technology department.
Jointly offered with: ENST650.
Credit Only Granted for: ENST450, ENST650, or MEES650.

ENST452 Wetland Restoration (3 Credits)
Design, construction, and evaluation of wetlands restored or created to provide ecosystem services or to mitigate losses due to development. Topics include fundamental properties of wetlands, ecological restoration theory, site selection and goal-setting, design plans, practices for establishing wetland hydrology, substrate, and vegetation, and restored ecosystem monitoring.
Prerequisite: (BSCI160 and BSCI161; or BSCI106); and (BSCI362, ENST450, ENST360, or BSCI361).

ENST453 Watershed Science: Water Balance, Open Channel Flow, and Near Surface Hydrology (3 Credits)
Definition and delineation of watersheds based on the stream orders. Discussion of the principle of conservation of mass in the context of life cycles (water cycle, carbon cycle, photosynthesis, aerobic cycle, anaerobic cycle, and nitrogen cycle) as it relates to our Biosystem. Conceptual study of hydrologic cycle components and their prediction using empirical and physical-based models is covered. Role of water as the dynamic force within the context of its interaction with landscapes of diverse geology and land cover will be discussed. Elements of watershed management is discussed.
Prerequisite: MATH120, ENST200, GEOG306 or BIOM301.
Recommended: PHYS121.
Credit Only Granted for: ENST453 or ENST653.

ENST456 Spatial Analysis and Ecological Sampling (3 Credits)
Teaches ENST students ecological sampling methods and applied spatial analysis skills. Students will work in small groups on research projects they develop and test during the semester. Students will develop a research hypothesis, test their hypothesis, display it visually in QGIS, and analyze it with appropriate statistical methods in QGIS and R Studio culminating in a final presentation.
Recommended: GEOG306 and GEOG373.
Restriction: Senior standing or higher; and permission of instructor.
Additional Information: Students will need to provide an 8GB (or larger) thumb drive for data storage.

ENST460 Principles of Wildlife Management (3 Credits)
Ecological principles and requirements of wildlife as basis for management, and introduction to the scientific literature. Conflicts in wildlife management, government administration of wildlife resources, legislation, and history of the wildlife management profession.
Prerequisite: Must have completed two semesters of biology laboratory; and (ENST360; or BSCI361). Or permission of AGNR-Environmental Science & Technology department.

ENST461 Urban Wildlife Management (3 Credits)
Ecology and management of wildlife in urban areas. For students in biological sciences, geography, landscape design, natural resources management, recreation and urban studies. Planning, design, and wildlife conservation in landscape ecology. Public attitudes, preferences, and values, review of private conservation organizations.

ENST462 Field Techniques in Wildlife Management (3 Credits)
Hands-on experience with field techniques in wildlife management focusing on various methods of conducting indices, estimates, and censuses of wildlife populations. Includes capture and handling of amphibians, reptiles, birds, and mammals by use of drift fences, cover boards, mist nets, box traps, and dart guns.
Prerequisite: ENST460. And BSCI160 and BSCI161; or BSCI106. And BSCI170 and BSCI171; or BSCI105.
Recommended: ENST461.
Restriction: Permission of AGNR-College of Agriculture & Natural Resources.

ENST470 Ideas into Impact (3 Credits)
This will be a capstone-type course based around developing proposals for projects emphasizing research, monitoring, design, restoration, managament, entrepreneurship, or other approaches to ecological or environmental questions, issues, or problems.
Restriction: Junior or Senior standing only; Permission of AGNR-Environmental Science & Technology department.

ENST472 Capstone (3 Credits)
This capstone course focuses on professional project preparation, presentation, and critical evaluation on environmental science research. Students will develop and present original projects and critique projects presented by others.
Restriction: Must be in a major within AGNR-Environmental Science & Technology department; and permission of AGNR-Environmental Science & Technology department.
Additional Information: This is the pinnacle course for students majoring in ENST and is therefore recommended in one of the students' final semesters.

ENST481 Ecological Design (4 Credits)
An advanced survey course on the field of ecological design. Principles of design are illustrated with case studies from biologically-based waste treatment systems, ecosystem management and sustainable development. Concepts covered include ecology, ecological engineering, nutrient cycling, emergy, lifecycle analysis, and design process. Technologies include treatment wetlands, living machines, anaerobic digestion, rain gardens, bioswales, bioremediation, algal turf scrubbers, and green building design.
Prerequisite: (MATH120 or MATH140; or must have completed MATH220); and (PHYS121 and CHEM131); and (BSCI361; or students who have taken courses with comparable content may contact the department). Or permission of instructor.
Jointly offered with: MEES681.
Restriction: Permission of AGNR-Environmental Science & Technology department.
Credit Only Granted for: ENST481, ENST681, or MEES681.

ENST485 Water Management in Urban Environment (3 Credits)
In this course we explore relevant processes in pathways and fluxes of water in urban areas; urban water balance and consequences of urbanization on surface and groundwater regimes; effects of climate and hydrology; quantity and quality of urban runoff, sources of pollution and behavior of contaminants; and ecological quality and processes associated with urban water. We study design and planning for water quality and quantity management in urban water systems; and engineered and ecologically engineered alternatives for stormwater management. Additionally, we look at the climate impacts on the urban water cycle.
Prerequisite: MATH120, MATH136, or MATH140.

ENST486 Senior Professional Experience (3 Credits)
Students will arrange an off-campus professional-level work experience related to Environmental Science and Technology (ENST) to develop expertise in a specific area of their ENST concentration curriculum. Classroom sessions will frame student experiences within the broader discipline of Environmental Science and Technology. This course will tie together current practices in the ENST career industry, proposal writing, critical analysis, and culminate in a final paper and presentation.
Prerequisite: ENST389.
Restriction: Must be in the Environmental Science and Technology program; and permission of AGNR-Environmental Science & Technology department.
Additional Information: The course has two types of activities: lecture and experiential learning. Students are expected to work on their professional-level experience for 90 hours and participate in a 2-hour lecture every other week, during the semester to develop their Senior Integrative Experience (SIE) project. Each student's research question, proposal methodology, analysis, paper, and presentation will follow learning outcomes of all ENST SIE course options.

ENST487 Environmental Conflicts and Decision Making (2 Credits)
Study major cases which focus on environmental science with concentration on the role and techniques of negotiation, collaborative decision making, and adaptive resource management as an environmental conflict resolution process.
Restriction: Senior standing. And must be in one of the following programs (Environmental Sci & Tech: Natural Resources Mgmt; Environmental Sci&Pol-Wildlife Ecology & Mgmt) ; or permission of AGNR-Environmental Science & Technology department.

ENST489 Research Experience (3 Credits)
An advanced research-based course in the field of environmental science and technology.
Restriction: Permission of AGNR-Environmental Science & Technology department.
Repeatable to: 6 credits.

ENST499 Special Topics in Environmental Science and Technology (1-4 Credits)
An independent study, and/or lecture, and/or laboratory series organized to study a selected phase of Environmental Science and Technology not covered by existing courses. Credit arranged with supervising faculty member.
Restriction: Permission of AGNR-Environmental Science & Technology department.

ENTE - Engineering Test and Evaluation

ENTE401 Development, Test & Evaluation, Verification & Validation (DTEVV) Fundamentals (3 Credits)
This course provides a basic understanding of the Development, Test & Evaluation, Verification & Validation (DTEVV) process used to produce new aviation systems. While the course will mainly focus on DTEVV of aviation platforms/systems, the basics taught can be applied to any domain. The course will provide students with: the history and development of DTEVV; basic DTEVV concepts and ways to approach DTEVV; issues relating to various forms of DTEVV (i.e.. Contractor, Government, Developmental, and Operational); common tools used in the test and evaluation community; the role of DTEVV during a systems lifecycle; and the engineering rigor that is applied to DTEVV to properly assess risk prior to fielding. This course will provide a solid foundation to join the DTEVV community upon completion.
Restriction: Permission from the ENTE Graduate Director.
Credit Only Granted for: ENTE401 or ENAE788F.
Formerly: ENAE788F .
Additional Information: Students must have prior coursework similar to the content offered in undergraduate courses ENAE432 or ENME361 along with enrollment in or completion of an engineering capstone course. Exceptions may be made on a case-by-case basis by the ENTE Graduate Director.

EPIB - Epidemiology and Biostatistics

EPIB300 Biostatistics for Public Health Practice (3 Credits)
An examination of biostatistical concepts and procedures as they relate to contemporary issues in public health. Focus on applications, hands-on-experience, and interpretations of statistical findings in public health research.
Prerequisite: Minimum grade of C- in CHEM131 and CHEM132.
Restriction: Must be in Public Health Science program; and must have earned a minimum of 60 credits.
Credit Only Granted for: EPIB300, EPIB315 or HLTH300.

EPIB301 Epidemiology for Public Health Practice (3 Credits)
An examination of the discipline of epidemiology and its application to public health issues and practices, covering current epidemiological concepts and methods.
Restriction: Must be enrolled in a major in SPHL-School of Public Health; and must have earned a minimum of 45 credits.

EPIB315 Biostatistics for Public Health Practice (3 Credits)
An examination of biostatistical concepts and procedures as they relate to contemporary issues in public health. Focus on applications, hands-on-experience, and interpretations of statistical findings in public health research.
Prerequisite: Minimum grade of C- in EPIB301.
Restriction: Must be enrolled in the Public Health Science, Public Health Practice, or Global Health majors.
Credit Only Granted for: EPIB300 or EPIB315.
Formerly: EPIB300.

EPIB330 Introduction to Infectious Disease Epidemiology (3 Credits)
Introduces students to the study of infectious disease through the application of epidemiologic methods. Students will review how infectious diseases impact global health, and examine epidemiological concepts related to infectious disease. These concepts include infectious disease transmission, prevention and control; study design; and outbreak and epidemic investigations. Infectious disease topics of concern to public health professionals will be covered including the COVID-19 pandemic, sexually transmitted infections, foodborne infections, healthcare-acquired infections and neglected tropical diseases, and future trends in the field of infectious diseases.
Prerequisite: EPIB301.

EPIB399 Epidemiology and Biostatistics Independent Study (1-3 Credits)
The EPIB undergraduate independent study is an opportunity for undergraduates from other departments in the SPH or the university to work with an Epidemiology and Biostatistics faculty member on research or special projects that are based out of EPIB.
Restriction: Must have earned a minimum of 60 credits; and minimum cumulative GPA of 3.0.
Repeatable to: 6 credits if content differs.

EPIB463 Introduction to Programming in R (3 Credits)
An introduction to basic programming in R; including principles, data analysis tasks such as the calculation of summary statistics and the creation of graphs; and the implementation of statistical analysis concepts such as T-tests, ANOVA and correlation.
Prerequisite: EPIB315.
Jointly offered with: EPIB695.
Credit Only Granted for: EPIB463 or EPIB695.

EPIB489 Special Topics in Epidemiology or Biostatistics (1-6 Credits)
Special topics in epidemiology or biostatistics.
Repeatable to: 6 credits if content differs.

FGSM - Federal and Global Fellows

FGSM310 Political Engagement and Advocacy (3 Credits)
An examination of questions and issues in the practice of political engagement and advocacy. Guest lecturers drawn from political, civic engagement, and advocacy arenas will visit class and participate in discussions.
Cross-listed with: HNUH318T.
Restriction: Must be in the Federal Fellows Program; and permission of instructor.
Credit Only Granted for: HNUH318T or FGSM310.

FGSM315 Civic Leadership and Human Services (3 Credits)
An examination of important issues, methodologies and tools of civic leadership in relation to human services, especially at the state and local level.
Cross-listed with: HNUH319T.
Restriction: Must be in the UMD Fellows Program; and must have permission of the UMD Fellows Program.
Credit Only Granted for: HNUH319T or FGSM315.

FGSM320 Public Health Policy (3 Credits)
An exploration of the major questions and issues facing the U.S. health care system as well as the formulation and implementation of health policy.
Cross-listed with: HNUH328T.
Restriction: Must be in the Federal Fellows Program; and permission of instructor.
Credit Only Granted for: UNIV348P, HNUH328T or FGSM320.
Formerly: UNIV348P.

FGSM330 Homeland and National Security Policy (3 Credits)
An examination of the concept of U.S. homeland and national security, threats, and major vulnerabilities in the context of recent history.
Cross-listed with: HNUH338T.
Restriction: Must be in the Federal Fellows Program; and permission of instructor.
Credit Only Granted for: UNIV348T, HNUH338T or FGSM330.
Formerly: UNIV348T.

FGSM340 Energy and Environmental Policy (3 Credits)
An examination of issues of energy and environmental sustainability through an investigation of policy-making in energy, climate change, and sustainable development.
Cross-listed with: HNUH348T.
Restriction: Must be in the Federal Fellows Program; and permission of instructor.
Credit Only Granted for: UNIV348E, HNUH348T or FGSM340.
Formerly: UNIV348E.

FGSM350 Critical Regions and International Relations (3 Credits)
An examination of international relations and foreign policy challenges in critical regions.
Cross-listed with: HNUH358T.
Restriction: Must be in the Global Fellows Program; and permission of instructor.
Credit Only Granted for: HNUH358T or FGSM350.

FGSM355 U.S. Intelligence and Policymaking (3 Credits)
Examines the role of intelligence in supporting U.S. security strategy and policy. Students will learn how the U.S. Intelligence Community (IC) is structured and organized, and will explore how intelligence is deployed to support the warfighter, diplomats, and senior-level decisionmakers. The course emphasizes the development of critical thinking and analytic skills, as well as professional writing and oral presentation abilities that are necessary for successful work in national security organizations. The course will feature guest lecturers from real-world practitioners to supplement course readings.
Cross-listed with: HNUH359T.
Restriction: Must be in the Global Fellows Program; and Permission of Department.
Credit Only Granted for: HNUH359T or FGSM355.

FGSM360 U.S. Diplomacy and Policymaking (3 Credits)
An examination of questions and issues in the practice of contemporary diplomacy and policy-making. Guest lecturers drawn from Washington policy-making and foreign service communities will visit class and participate in discussion.
Cross-listed with: HNUH368T.
Restriction: Must be in the Global Fellows Program; and permission of instructor.
Credit Only Granted for: HNIUH368T or FGSM360.

FGSM365 Economic Diplomacy: Challenges and Opportunities (3 Credits)
An examination of political, social, and environmental aspects of the global economy in the context of power competition and technological change.
Cross-listed with: HNUH369T.
Restriction: Must be in the UMD Fellows Program; and must have permission of the UMD Fellows Program.
Credit Only Granted for: FGSM365 or HNUH369T.

FGSM370 Science Diplomacy: Foreign Policy & Science, Technology, and Innovation (3 Credits)
An exploration of the critical roles scientific knowledge and technological innovation play in the formation and implementation of foreign policy issues, including energy and climate change, public health, space and innovation, and economic development.
Cross-listed with: HNUH378T.
Restriction: Must be in the Global Fellows Program; and permission of instructor.
Credit Only Granted for: UNIV389F, HNUH378T or FGSM370.
Formerly: UNIV389F.

FGSM380 Responses to Global Challenges (3 Credits)
An examination of global issues and responses primarily from the perspective of the practitioner. The focus will be on social, humanitarian, and human rights issues in different global contexts.
Cross-listed with: HNUH388T.
Restriction: Must be in the Global Fellows Program; and permission of instructor.
Credit Only Granted for: UNIV389B, HNUH388T or FGSM380.
Formerly: UNIV389B.

FGSM390 Global Health Challenges and Water Security (3 Credits)
An examination of questions and issues of global health and water security. Expert practitioners will also visit class and participate in discussions.
Cross-listed with: HNUH398T.
Restriction: Must be in the Global Fellows Program; and permission of instructor.
Credit Only Granted for: HNUH398T, HONR378M, or FGSM390.

FGSM398 Federal and Global Experiential Learning (3-9 Credits)
This is the experiential course component of the Federal Fellows Program and Global Fellows Program.
Cross-listed with: HNUH398P.
Restriction: Permission of instructor.
Repeatable to: 9 credits if content differs.
Credit Only Granted for: FGSM398 or HNUH398P.

FIRE - First-Year Innovation & Research Experience

FIRE120 FIRE SEMESTER 1 (3 Credits)
Engages the research process through the design, research, collaborative authorship and iterative refinement to establish an original research trajectory. Students find and analyze primary and secondary sources, think creatively, identify gaps in existing literature, and communicate a research plan in a scholarly fashion. Students work collaboratively to solve scientific and societal problems using technology and creative inquiry through productive team communication.
Restriction: Must be a first-semester student in The First-Year Innovation & Research Experience (FIRE) program.
Additional Information: This is the first course in the First-Year Innovation & Research Experience (FIRE) program sequence.

FIRE198 FIRE SEMESTER 2 (2 Credits)
This is the second course in the First-Year Innovation & Research Experience (FIRE) program sequence. Students in this course join a research stream and gain discipline-specific training in that research setting. This course focuses on the concepts related to the process of independent research, including collaboration with peers, communication of ideas, troubleshooting unexpected outcomes, and discipline-specific methodologies.
Recommended: FIRE120.
Restriction: Must be a second-semester student in The First-Year Innovation & Research Experience (FIRE) program.

FIRE298 FIRE Semester 3 (3 Credits)
Capstone course in the FIRE (First-Year Innovation & Research Experience) program sequence. Students in this course transition from trainee to practitioner in their lab. This course focuses on the concepts related to the process of independent research including collaboration with peers, communication of ideas, troubleshooting unexpected outcomes, and discipline-specific methodologies.
Prerequisite: FIRE198.
Repeatable to: 3 credits.

FIRE398 FIRE Research Leadership (1-3 Credits)
Earn academic credit for the time spent supporting, mentoring, and leading students in FIRE Research streams.
Prerequisite: FIRE298.
Repeatable to: 12 credits.

FMSC - Family Science

FMSC110 Families and Global Health (3 Credits)
Students will explore, define, and study global health, social determinants of health, health inequalities, gender inequality, family violence, and maternal and child health using a global perspective.

FMSC111 Credit Cards and College Students (1 Credit)
Provides college students with factual information about basic money management skills, emphasizing the responsible use of credit, specifically credit cards. Topics will include financial goals, spending plan, wise use of credit, debt management, consumer credit protection, and ID Theft. Online lessons will include video clips and interactive class activities. Students will learn the basics to build a strong financial future.
Recommended: Moderate level of computer literacy, especially Internet and ELMS. Reliable computer and Internet access.
Credit Only Granted for: FMSC111, FMSC341 or FMSC498D.
Formerly: FMSC498D.

FMSC123 Personal Financial Literacy: From Distress to Success (3 Credits)
Exploring strategic thinking, career, education, financial planning during college years as the foundation for success in living a meaningful life. While introducing relevant institutions and tools techniques that are critical for financial planning, this course applies value-based goal setting and strategic planning that inform individuals' paths for a successful career, educational attainment, and optimum (mental, physical and financial) wellbeing throughout their life cycle. The course particularly emphasizes the individual's responsibility of living in an institution rich society, where, continuous learning, understanding institutions, rational decision-making, valuing relationships and networking, early career development, record keeping, budgeting, generating income and wealth, purposeful spending, saving and investing, tax planning, appropriate use of loans, risk taking and insurance, and retirement planning are well rewarded and ensure the optimum use of college years and the rest of life-course.

FMSC126 International Family Law: Parent/Child Relationship in the Americas (3 Credits)
In this Global Classroom, U.S. students will work synchronously online with their international peers in Brazil to critically think about cutting-edge ethical, legal, and policy, issues in the field of International Family Law focusing on the parent/child relationship. Topics range from education, foster care, to human development. Students contrast parents' rights to raise their children as they see fit with the tension when the state steps in to provide protection in areas like medical decision making and child abuse and consider the social, cultural, racial, religious, economic, or socioeconomic contexts that influence each of these topics. In so doing, students will be challenged to think critically and see their place in creating actionable change in a global society.

FMSC170 Modern Families (3 Credits)
What is a Family? Engage in examination of the current trends and controversial issues in family life, including issues of marriage, reproductive technologies, adoption, child custody, remarriage, and marital violence.
Credit Only Granted for: FMSC170 or FMSC298F.
Formerly: FMSC298F.

FMSC177 BE WELL: Building Emotional Wellness through ExperientiaL Learning (1 Credit)
Students on UMD campus experience new challenges to their mental health and well-being every semester, and there are limited resources to help students manage their own health or to support their peers. This experiential skill development workshop course is designed to assist students in developing their knowledge in ways to recognize, manage, and cope with symptoms of stress, anxiety, and depression. There is a focus on coping with pandemic-related and course-related concerns, relationship issues, and a range of other student concerns.

FMSC186 Family Law and Ethics in Assisted Reproduction (1 Credit)
For students interested in studying the law, public health and/or family science, this course examines the cutting-edge law and ethics of assisted reproduction including the technologies of sperm and egg donation, in vitro fertilization, surrogacy, and reproductive organ transplants, and the impact on families.

FMSC190 Man Up! Where Are The Fathers? (3 Credits)
An examination of changing fatherhood roles, health, and inequality in diverse families. Focus will be on masculinities and disparities among men by race and class; provider role expectations; and trauma and violence faced by men in contemporary society.

FMSC215 Foster Care and Adoption; Law, Policy, and Family (1 Credit)
In this Student Initiated Course, students will examine their preconceived notions of foster care and adoption as they work to become agents for change in the systems. Regular guest speakers will share their experiences. Along with your student instructor you'll explore various outcomes of the systems including trauma, mental health and later-life outcomes. Your faculty instructor will encourage you to critically think about legal and policy issues, both in Maryland and internationally, like the foster to prison pipeline and adopting from other cultures. Students will examine contentious issues like legal interventions, LGBTQ, Native American Indian, transracial, religious and others relating to the systems and the socioeconomic impacts on families. Classes are student-driven and discussion-based, allowing students to explore ethical considerations and possible life paths.

FMSC260 Couples, Marriage, and Families: Intimate Relationship Across the Life Course (3 Credits)
Covers the different aspects of couple relationships and family life. This includes common problems in couple relationships, and resources to strengthen couple and family relationships. You will also learn about stages of relationships, theories of love and family, policy related to couples and family formation, and how research is conducted with couples and families. Together, we will discuss and explore issues that couples and families face in modern times and will consider how many of these issues have changed due to policy, technology, attitudes, and a variety of other societal factors that impact relationships in the 21st century. You will also learn important methods of strengthening current and future relationships.

FMSC265 Teaching Menstrual Health: Dispelling Myths and Misconceptions (3 Credits)
Provides a platform to teach UMD undergraduate students and BHU Bachelor of Education students about the intersections of gender, culture, and health. We will explore how menstruation is addressed in different cultures and uncover myths and misconceptions that impact individuals, their families and communities. Furthermore, the course emphasizes the health cost (physical and mental) of not educating youth about this vital process and discusses the need for an intervention. The course provides essential skills to participating students for the development of an intervention. Key concepts include: theoretical understanding of menstrual health and its impact on girls and women's lives from cross cultural perspectives, the importance of deconstructing myths and misconceptions and the importance of educating both girls and boys; cultural taboos and patriarchal power relations that contribute to myths, misconceptions and practices; public health interventions addressing the cost of ignoring adolescent health issues including menstrual health; the impact of providing agency to young girls and boys to challenge the status-quo; and links between knowledge about menstruation, human rights, gender equality and the SDGs.

FMSC270 Sex, Drugs, and Social Media: Adolescent Health and Development (3 Credits)
This course will ask: How can families, schools, communities, and society help adolescents to navigate contemporary stressors and develop into physically and mentally healthy adults? To do this, we will use research, and an understanding of adolescent development, to explore and analyze issues affecting the health and behavior of American adolescents. Such issues include (but are not limited to) sex education, the role of social media in mental health, substance use, policing in schools, dating violence, suicide prevention, access to sexual and reproductive health care, and school start times. We will consider how adolescent well-being is shaped by social contexts, including the role of parents and family members, peers, schools, communities, social media, and culture. We will examine policies and programs that affect adolescents, how effective they are at promoting adolescent health, and how they might be improved to better support healthy adolescent development.

FMSC286 Assisted Reproduction Law and Policy in the US and Brazil (3 Credits)
In this Global Classroom, U.S. students will work synchronously online with their international partners in Brazil to critically think about cutting-edge ethical, legal, policy and scientific issues in the field of Assisted Reproduction Technologies (ART) in the two countries. This course looks at conventional families created in unconventional ways to examine such topics as sperm and egg donation, in vitro fertilization, surrogacy, reproductive organ transplants and more - while considering the social, cultural, racial, religious, economic, or socioeconomic contexts that influence each. Students will work with their foreign peers in small groups to compare ART in each country and then create proposed legislation for either the U.S. or Brazil which their international group will present online to their colleges and submit to the country's legislators. In so doing, students will be challenged to think critically and see their place in creating actionable change in a global society.
Credit Only Granted for: FMSC186 or FMSC286.
Additional Information: This is a global classroom course where students will learn online, meet once a week in a synchronous class on Webex with their Brazilian classmates, and work individually via Webex in small international groups.

FMSC289 Special Topics in Family Science (3 Credits)
Topics of special interest under the general guidance of the Department of Family Science.
Repeatable to: 9 credits if content differs.

FMSC290 Family Economics (3 Credits)
Application of economic methodology to study families under various economic situations. Examination of how decisions about marriage, divorce, fertility, consumption and time use are influenced by labor/housing markets, tax structure, social welfare benefits and other economic considerations.
Credit Only Granted for: FMSC290 or FMST290.
Formerly: FMST290.

FMSC298 Special Topics in Family Science (1-3 Credits)
Topics of special interest under the general guidance of the Department of Family Studies.
Repeatable to: 12 credits if content differs.
Formerly: FMST298.

FMSC302 Research Methods in Family Health (3 Credits)
Introduction to the methods of the social and behavioral sciences employed in family science. The role of theory, the development of hypotheses, measurement, design, and data analysis.
Prerequisite: Must have completed an introductory statistics course.
Restriction: Must be in a major within SPHL-Family Science department.

FMSC310 Maternal, Child and Family Health (3 Credits)
Overview of the major issues in Maternal, Child, and Family Health in the U.S. and the world. The course will cover the social, political, environmental, and economic factors that shape the health of women, children, and families throughout the life course. It will employ the core disciplines of public health -- 1) epidemiology/biostatistics, 2) environmental health, 3) health policy and administration, and 4) social and behavioral health -- to examine these factors. The course introduces specific issues and interventions and places these issues and interventions within their broad sociohistorical context.
Credit Only Granted for: FMSC310, FMSC410 or FMSC498A.
Formerly: FMSC498A and FMSC410.
Additional Information: A comprehensive understanding of maternal, child, and family health, with additional emphasis on environmental health, needs assessment and evaluation, enabling students to more effectively address issues in the workplace.

FMSC330 Family Health: Health Happens in Families (3 Credits)
The objective of this gateway course is to help you understand and apply basic theories and empirical data on family health. The course is designed to provide you with skills to think critically about theories including: Life Course Theory, the Bio-Ecological and Social-Ecological Models, and Systems Theory. We will ask questions about the distinct qualities and intersections of contexts and characteristics that impact the functioning of families. We will apply theory and research to topical issues in family health that are impacted by social structures such as conflict, crisis, migration, incarceration and inequalities.
Restriction: Sophomore standing or higher.

FMSC332 Children in Families (3 Credits)
A family life education approach to the study of children and families. Emphasis on the interaction of children with parents, siblings, extended kin, and the community.
Prerequisite: Minimum grade of C- in PSYC100, SOCY100 or SOCY105.
Credit Only Granted for: FMSC332 or FMST332.
Formerly: FMST332.

FMSC340 Mental Health and Healing in Families (3 Credits)
Using an interdisciplinary approach to study mental health, mental wellness, and substance use, we will answer questions such as: How has our understanding and treatment of mental health changed throughout history? What are the current prevalence patterns and risk factors associated with mental health conditions? What is the prevention to postvention continuum? What is the role of relationships, families, and communities in addressing mental health? How do we diagnose and treat various mental health disorders using the best available research? And, what are the various mental health disciplines and how do they differ? This course is designed to examine mental health issues across the life course. We will explore the influence of social contexts, including racism and additional forms of othering, on mental health and wellness, and introduce the health systems that support mental health prevention and treatment.

FMSC341 Personal and Family Finance (3 Credits)
Individual and family financial strategies with emphasis on financial planning, savings, investments, insurance, income taxes, housing, and use of credit. Planning, analyzing, and controlling financial resources to resolve personal/family financial problems and to attain financial security.
Credit Only Granted for: FMSC341 or FMST341.
Formerly: FMST341.

FMSC374 Working with Diverse Families in Public Health Practice (3 Credits)
Focuses on the "doing" and modeling of skills required in navigating diverse social environments with families. These skills are necessary to engage in authentic work as family scientists, public health professionals, and family health practitioners. Using an intersectional framework, we will examine cultural, ethnic, and linguistic diversity for families impacted by challenges to equity and privilege. The course material emphasizes deep knowledge and skill building towards cultural sensitivity, including history, values, language, religion, and communication with families across multiple racial and ethnic backgrounds. Students will also explore differences emerging from experiences of poverty, sexual orientation and gender identity, and disability. The goal of the course is to support students in developing a family/professional alliance for health and well-being.
Prerequisite: Minimum grade of C- in FMSC330.

FMSC381 Family Inequality (3 Credits)
Social, political, cultural and economic factors influencing income and wealth in American families.
Prerequisite: Minimum grade of C- in PSYC100, SOCY100, or SOCY105.
Restriction: Must be in a major within SPHL-Family Science department.

FMSC382 Family Mediation and Negotiation (3 Credits)
Investigates mediation as a forum of peaceful intervention. It is designed to provide students with an introduction and basic understanding of the essential principles of mediation and opportunities to put those principles to work. In so doing, students will obtain an in-depth knowledge of a practical "hands on" approach to divorce mediation as the conduct mediation skill builders and facilitate a successful mediation. Students will learn major mediation interventions and how such interventions may help establish a new dynamic among family members in their communications and relationships. To assist in understanding, we will discuss family law issues and ethics. The course also includes a focus on negotiation theory and skills and students will conduct a negotiation. We will use multi-media presentations, real life mediation observation, lecture and class discussion, role-play, and academic review and critic to reach the course goals and objectives.
Recommended: FMSC487 and FMSC341.
Credit Only Granted for: FMSC498M or FMSC382.
Formerly: FMSC498M.

FMSC383 Health and Human Services Delivery and Evaluation (3 Credits)
Processes of service delivery with special emphasis upon relationships among managers, service providers and clients. The impact of human service systems on families.
Prerequisite: FMSC330.
Restriction: Must be in a major within SPHL-Family Science department.

FMSC386 Experiential Learning (3-6 Credits)
Prerequisite: Permission of SPHL-Family Science department.
Restriction: Junior standing or higher.
Credit Only Granted for: FMSC386 or FMST386.
Formerly: FMST386.

FMSC399 Independent Study (1-6 Credits)
Prerequisite: Permission of SPHL-Family Science department.
Repeatable to: 12 credits.
Formerly: FMST399.

FMSC420 African American Families (3 Credits)
Examination of the history, structure, cultural foundation, and diversity of African American family life is the focus of this class. Presentations and discussions enable students to identify, analyze, and assess: (1) the major theoretical perspectives used in the study of African American families; (2) the impact of social policy on African American families; and (3) specific areas of family life (e.g., marriage and divorce, parenting, child development, health disparities).
Recommended: FMSC330.
Credit Only Granted for: FMSC420 or FMSC498F.
Formerly: FMSC498F.

FMSC431 Family Crises, Emergencies and Interventions (3 Credits)
Examines the stressors in life that may lead families into a state of crisis or emergency and what can be done to help families when the need arises. Both internal stressors, such as substance abuse, finances, divorce, illness or parent-child conflict, and external stressors, such as community violence and natural disasters, are examined. Using theories and techniques for intervention and enhancement, the course examines factors involved in stressors turning into a family crisis and how factors such as emergency preparedness, social support and public policy can be a source of family resilience or protect families from negative outcomes.
Prerequisite: Minimum grade of C- in PSYC100, SOCY100, or SOCY105.

FMSC432 Adult Development and Aging in Families (3 Credits)
Theory, research, history, and programming related to adult development and aging in the intergenerational context of family.
Prerequisite: Minimum grade of C- in PSYC100.
Restriction: Must be in a major within SPHL-Family Science department.
Credit Only Granted for: FMSC432 or FMST432.
Formerly: FMST432.

FMSC440 Death and Loss in Family Life (3 Credits)
Examination of how families experience grief and loss resulting from the death of a family member, including health and financial consequences. Overview of historical, social, psychological, cultural, medical, and legal dimensions of death in families from diverse backgrounds. Exploration of how the health care system and funeral home industry assist families in managing death and loss.
Recommended: Moderate level of computer literacy, especially Internet and ELMS. Reliable computer and Internet access.
Credit Only Granted for: FMSC440 or FMSC498B.
Formerly: FMSC498B.

FMSC445 Sexuality: Issues in Family Therapy and Service Delivery (3 Credits)
Typical, dysfunctional, and pathological sexual functioning, including effects on individuals, couples, and family systems. Sensitizes students to sexual issues, explores how perceptions of such issues affect work with people, and emphasizes implications for marriage and family therapy.
Prerequisite: A basic course in human sexuality; and permission of instructor. Jointly offered with FMSC645.
Credit Only Granted for: FMSC445 or FMSC645.

FMSC460 Violence in Families (3 Credits)
Theories of child, spouse, and elder abuse in the family setting. Emphasis on historical, psychological, sociological and legal trends relating to physical, emotional, and sexual abuse. Introduction to methods for prevention and remediation.
Prerequisite: SOCY100, SOCY105, or PSYC100.
Credit Only Granted for: FMSC460 or FMST460.
Formerly: FMST460.

FMSC477 Internship and Analysis in Family Health (3 Credits)
A supervised internship and a seminar requiring analysis. Opportunities to integrate theory and practice including 120 hours of contracted field experience.
Prerequisite: FMSC383; and 9 credits in FMSC courses; and permission of SPHL-Family Science department.
Restriction: Must be in a major within SPHL-Family Science department.
Credit Only Granted for: FMSC477, FMST347, or FMST477.
Formerly: FMST477.
Additional Information: See department for application procedures.

FMSC485 Introduction to Family Therapy (3 Credits)
The fundamental theoretical concepts and clinical procedures of marital and family therapy including premarital and divorce therapy issues.
Prerequisite: FMSC330; or 1 course from PSYC300-499 course range.
Credit Only Granted for: FMSC485 or FMST485.
Formerly: FMST485.

FMSC486 Law, Public Health and the Cuban Family (4 Credits)
A short-term summer study abroad course that is a comparative law and public health course. Students travel to Havana, Cuba to compare family problems in a capitalist versus socialist society within the context of legal, public health, social, cultural and economic changes.
Recommended: FMSC487.
Jointly offered with: FMSC686.
Credit Only Granted for: FMSC486, FMSC686 or MIEH698B.
Additional Information: This is a study abroad course which will primarily occur in Cuba. Additionally, the course involves an online component prior to and following the trip.

FMSC487 Family Law (3 Credits)
Designed for students interested in studying the law, public health, and family science, this course provides students with a general overview of family law and the impact on healthy families. The course also includes the study of cutting-edge issues such as marriage equality, assisted reproduction and ethical issues that may arise.

FMSC498 Special Topics: Family Science (1-3 Credits)
Special course topics in family studies.
Prerequisite: Permission of SPHL-Family Science department.
Repeatable to: 6 credits if content differs.
Formerly: FMST498.

FREN - French

FREN103 Intensive Elementary French (4 Credits)
Covers speaking, reading, writing, listening, and culture of French-speaking world.
Prerequisite: Must have appropriate World Language Placement (WLP) score.
Restriction: Must not be a native/fluent speaker of French.

FREN169 Special Topics in Study Abroad I (1-6 Credits)
Special topics course taken as part of an approved study abroad program.
Repeatable to: 15 credits if content differs.

FREN203 Intensive Intermediate French (4 Credits)
Covers speaking, reading, writing, listening, and culture of French-speaking world.
Prerequisite: FREN103; or must have appropriate World Language Placement (WLP) score.
Restriction: Must not be a native/fluent speaker of French.
Credit Only Granted for: FREN201 or FREN203.

FREN204 French Grammar and Composition (3 Credits)
Intensive study of French grammar and composition.
Prerequisite: FREN203; or must have appropriate World Language Placement (WLP) score.
Restriction: Not open to native/fluent speakers of French.

FREN211 French Reading and Conversation (3 Credits)
Practice in spoken French at intermediate level based on readings in a variety of genres. Written homework and exams.
Prerequisite: FREN203.
Restriction: Must not be a native/fluent speaker of French.

FREN241 Women Writers of French Expression in Translation (3 Credits)
Works and ideas of 20th century women writers of French in Canada, Africa, the Caribbean and France. Taught in English.

FREN242 Francophone Writers of Africa and the African Diaspora (3 Credits)
An analysis of the works and ideas of 20th and 21st century Francophone writers (Africa, the Caribbeans, France). Taught in English.

FREN243 Masterpieces in French and Francophone Cinemas (3 Credits)
This course, taught in English, will present a large array of films directed by famous French directors (Jean Renoir, Robert Bresson, Jean-Luc Godard, Agnes Varda, etc..) and Francophone filmmakers (Arcand, Sembene) who were internationally known in their time and have had a considerable influence on today's filmmakers in the U.S. (Tarantino, Lynch, Lee, etc..) and abroad (Sissoko, Angelopoulos, VonTrier, ect..).

FREN250 Introduction to Cultural and Textual Analysis (3 Credits)
Introduction to cultural and textual analysis of selected readings from various genres in French literature. Taught in French.
Prerequisite: FREN204; or students who have taken courses with comparable content may contact the department.
Restriction: Must not be a native/fluent speaker of French.
Credit Only Granted for: FREN250 or FREN250H.

FREN269 Special Topics in Study Abroad II (1-6 Credits)
Special topics course taken as part of an approved study abroad program.
Repeatable to: 15 credits if content differs.

FREN298 Aspects of French Civilization (3 Credits)
Topic to be determined each semester. Historical or thematic approaches to French art, literature, and culture. Taught in English.
Repeatable to: 6 credits if content differs.
Additional Information: Credit may not be applied to French major.

FREN301 Composition and Style (3 Credits)
Grammatical analysis, elements of style; range of written genres.
Prerequisite: FREN250; or students who have taken courses with comparable content may contact the department.
Restriction: Must not be a native/fluent speaker of French.

FREN302 Introduction to Translation (3 Credits)
Hands-on practice in translation to include a variety of formats and texts (for example, advertising, legal, technical, literary, journalistic, media...) into French and/or English. Includes an extensive overview of translation techniques, theories and approaches. Taught mainly in French.
Prerequisite: FREN301; or students who have taken courses with comparable content may contact the department.

FREN303 Translation: English to French (3 Credits)
Practicum in translation primarily from English to French; contrastive analysis.
Prerequisite: FREN301; or students who have taken courses with comparable content may contact the department.

FREN306 Commercial French I (3 Credits)
Introduction to commercial French including correspondence and business terminology. Emphasis on cross-cultural concepts needed for successful interaction within business settings. Taught in French.
Prerequisite: FREN301; or students who have taken courses with comparable content may contact the department.

FREN311 Advanced Oral Expression (3 Credits)
Linguistic and thematic analysis of written, audio, and visual texts. Focus on aural and oral skills. Some written assignments and evaluation.
Prerequisite: FREN250; or students who have taken courses with comparable content may contact the department.
Restriction: Must not be a native/fluent speaker of French.

FREN312 France Today (3 Credits)
Analysis and discussion of current events and institutions using various French media resources.
Prerequisite: FREN301; or students who have taken courses with comparable content may contact the department.
Restriction: Must not be a native/fluent speaker of French.

FREN313 Current Issues in the French-Speaking World (3 Credits)
Analysis and discussion of current events and institutions in the French-speaking world using various French-language media resources with an emphasis on countries and regions outside of France.
Prerequisite: FREN301; or students who have taken courses with comparable content may contact the department.

FREN351 From Romanticism to the Age of Modernism and Beyond (3 Credits)
A survey of the chief authors and major movements of French literature from Pre-Romanticism to the present.
Prerequisite: FREN301; or students who have taken courses with comparable content may contact the department.

FREN352 From the Age of Epic and Romance to the Enlightenment (3 Credits)
A survey of the chief authors and major movements of French literature from the Middle Ages to the end of the 18th century.
Prerequisite: FREN301; or students who have taken courses with comparable content may contact the department.

FREN369 Special Topics in Study Abroad III (1-6 Credits)
Special topics course taken as part of an approved study abroad program.
Repeatable to: 15 credits if content differs.

FREN386 Experiential Learning (3-6 Credits)
Prerequisite: Permission of ARHU-School of Languages, Literatures, and Cultures department.
Restriction: Junior standing or higher.

FREN387 Critical Writing on France and the French-Speaking World (3 Credits)
Intensive writing course based on focused study of issues and concerns drawn from French and Francophone literatures, films, and cultures. Elements of style, review of grammar. Taught in French.
Prerequisite: FREN301.
Restriction: Not open to Native speakers.

FREN388 Language House Colloquium (1 Credit)
The Language House Colloquium is a one-credit course for students residing in the Language House Immersion Program. The course focuses on the further development of skills in the target language and the acquiring of cultural knowledge of the countries that speak the target language. The course is designed to supplement the learning that takes place on a daily basis in the Language House program.
Restriction: Must be a resident of Language House.
Repeatable to: 4 credits.

FREN399 Directed Study in French (1-3 Credits)
Advanced undergraduates develop syllabus, reading list, and course requirements with interested faculty member. Designed for in-depth study of material not offered in regular courses or as expansion of course material. To be planned during semester preceding registration.
Prerequisite: Permission of ARHU-School of Languages, Literatures, and Cultures department.
Repeatable to: 3 credits.

FREN407 History of the French Language (3 Credits)
Evolution of the French language from Latin to modern French. Taught in French.
Prerequisite: FREN351 or FREN352; or permission of ARHU-French & Italian Languages & Literatures department.

FREN414 French for International Relations (3 Credits)
Historically, French has played a key role in the development and organization of International Relations. It remains an important tool for diplomats and an official working language of major international organizations. Students will be introduced to the French vocabulary and terminology specific to diplomatic discourse and the field of International Relations. Through French-speaking media analysis and simulated work-related situations in an international context, students will learn how to pitch a project, present a country situation, give a thematic presentation, and engage in successful negotiations. Students will also acquire the skills and proficiency to understand and produce professional documents used in the International Relations field. Taught in French.
Prerequisite: FREN387.

FREN421 Francophone African Film (3 Credits)
Imaginary and Memory in the reality of Francophone African Film from 1960-present. Taught in English.
Cross-listed with: CINE421.
Credit Only Granted for: FREN421, CINE421 or FILM421.
Formerly: FILM421.

FREN423 Women and French Cinema (3 Credits)
Cultural identity, social boundaries and gender roles in French film as well as introduction to film textual analysis and diverse film theories (semiotics, film and psychoanalysis, feminist film theory, structuralism, narratology, spectatorship and cultural studies). Taught in English.
Cross-listed with: CINE423.
Credit Only Granted for: FREN423, CINE423 or FILM423.
Formerly: FILM423.

FREN429 Studies in French Literature and Culture of the Renaissance (3 Credits)
Selected topics in French literature of the Renaissance.
Prerequisite: FREN387; and (FREN351 or FREN352). Or permission of ARHU-French & Italian Languages & Literatures department.
Repeatable to: 6 credits if content differs.

FREN439 Studies in 17th Century French Literature and Culture (3 Credits)
Selected topics in seventeenth-century French literature.
Prerequisite: FREN387; and (FREN351 or FREN352). Or permission of ARHU-French & Italian Languages & Literatures department.
Repeatable to: 6 credits if content differs.

FREN449 Studies in 18th Century French Literature and Culture (3 Credits)
Selected topics in eighteenth-century French literature.
Prerequisite: FREN387; and (FREN351 or FREN352). Or permission of ARHU-French & Italian Languages & Literatures department.
Repeatable to: 6 credits if content differs.

FREN459 Studies in 19th Century French Literature and Culture (3 Credits)
Selected topics in nineteenth-century French literature.
Prerequisite: FREN387; and (FREN351 or FREN352). Or permission of ARHU-French & Italian Languages & Literatures department.
Repeatable to: 6 credits if content differs.

FREN469 Studies in 20th Century French Literature and Culture (3 Credits)
Selected topics in twentieth-century French literature.
Prerequisite: FREN387; and (FREN351 or FREN352). Or permission of ARHU-French & Italian Languages & Literatures department.
Repeatable to: 6 credits if content differs.

FREN472 The Construction of French Identity II: From the Revolution to the Early Twentieth Century (3 Credits)
French life, customs, culture, traditions (1750 to the early twentieth century).
Prerequisite: FREN387; or permission of ARHU-French & Italian Languages & Literatures department.

FREN474 Contemporary France: A Sociocritical Approach (3 Credits)
A sociocritical approach to understanding modern French society through the study of print and non-print media documents (autobiography, film, and paraliterature), with reference to the Francophone world. Taught in French.
Prerequisite: FREN387; or permission of ARHU-French & Italian Languages & Literatures department.
Recommended: FREN473.

FREN478 Themes and Movements of French Literature in Translation (3 Credits)
Studies treatments of thematic problems or literary or historical movements in French literature. Topic to be determined each semester. Taught in English.

FREN479 Masterworks of French Literature in Translation (3 Credits)
Treats the works of one or more major French writers. Topic to be determined each semester. Taught in English.

FREN480 French Cinema: A Cultural Approach (in Translation) (3 Credits)
A study of French culture, civilization, and literature through the medium of film. Taught in English.
Cross-listed with: CINE420.
Credit Only Granted for: FREN480, CINE420 or FILM420.
Formerly: FILM420.

FREN482 Gender and Ethnicity in Modern French Literature (3 Credits)
Literature by women writers of France and other French speaking areas with a focus on the relationship between gender, ethnicity and writing. Taught in English.

FREN488 Special Topics in Francophone Studies (3 Credits)
Topic and language of instruction to be announced when offered.
Repeatable to: 9 credits if content differs.

FREN489 Seminar in Themes or Movements of French Literature (3 Credits)
Seminar on selected themes or movements of French literature.
Prerequisite: FREN387; and (FREN351 or FREN352). Or permission of ARHU-French & Italian Languages & Literatures department.
Repeatable to: 6 credits if content differs.

FREN495 Honors Thesis Research (3 Credits)
The writing of a paper under the direction of a professor in this department and an oral examination. Required to fulfill the departmental honors requirement.
Restriction: Must be admitted to the departmental honors program.

FREN498 Special Topics in French Literature (3 Credits)
Selected topics in French literature.
Prerequisite: FREN387; and (FREN351 or FREN352). Or permission of ARHU-French & Italian Languages & Literatures department.
Repeatable to: 6 credits if content differs.

FREN499 Special Topics in French Studies (3 Credits)
An aspect of French studies, the specific topic to be announced each time the course is offered.
Prerequisite: FREN387; or permission of ARHU-French & Italian Languages & Literatures department.
Repeatable to: 6 credits if content differs.

GBHL - Global Health

GBHL200 Introduction to Global Health (3 Credits)
Designed to introduce you to global health. Global health challenges are immensely complex and underscore the multiple interconnections among social, economic, environmental, and biotechnological dimensions of health problems worldwide. Global health encompasses health care systems, medical practices, and ideas about illness in cross-cultural contexts, as well as issues of health development, global health inequity, racism and other -isms, and human rights issues. We will explore theoretical frameworks and practical perspectives shaping the global health ecosystem domestically, internationally, and virtually.
Credit Only Granted for: GBHL200 or MIEH400.
Formerly: MIEH400.

GBHL210 Careers in Global Health (1 Credit)
Designed to introduce you to the global health careerscape: the various paths, current and emerging trends, possible employers, and essential skills for future professionals. We will use campus and external resources for career exploration as you identify opportunities to build your professional network and gain experience. Prepare to engage in future global health experiential learning through research, internships, study abroad or field work
Recommended: Sophomore standing.
Restriction: Must have earned fewer than 90 credits.

GBHL310 Introduction to Global Health Literacy (3 Credits)
The ability to access, understand, appraise, and use information is critical for the improved health and well being of populations around the world. This course will address how population health is affected by politics, culture, geography, and/or social determinants of health, with a focus on contemporary global health challenges including climate-related disasters and pandemic preparedness. Students will explore and gain skills related to health communication and education.
Prerequisite: Must have completed Fundamental Studies: Academic Writing.
Recommended: Enrolled in or completed SPHL100 or GBHL200.
Restriction: Must have earned a minimum of 30 credits; and must not not have taken HLTH431.

GBHL386 Global Health Experiential Learning (2-6 Credits)
Supervised internship, independent study, or field work in global health conducted with oversight from faculty in the UMD Global Health program.
Prerequisite: Minimum grade of C- in GBHL200 and GBHL210.
Recommended: Upper level Global Health major courses.
Restriction: Must have earned a minimum of 60 credits; and Permission of SPH-Global, Environmental, and Occupational Health department.

GBHL389 Global Health Research (2-6 Credits)
Provides undergraduate students with the opportunity to earn academic credit for assisting a faculty member with their global health research. Research projects should address public health challenges through the lens of environmental, biological, geopolitical, socioeconomic, and cultural factors.
Recommended: Minimum grade of C- in GBHL200 and GBHL210.
Restriction: Permission of Global, Environmental, and Occupational Health department.
Repeatable to: 6 credits if content differs.
Additional Information: Students must identify a UMD faculty mentor prior to obtaining departmental permission.

GBHL399 Global Health Internship (2-6 Credits)
The Global Health internship course provides students with academic, research and professional development accompanying a time-limited, supervised period of professional experience carried out in a related professional organization or research setting.
Prerequisite: GBHL200 and GBHL210 completed with a C- or higher.
Restriction: Global Health major; 45 credits completed; permission of Global Health program required.
Repeatable to: 6 credits if content differs.
Additional Information: Students identify and secure their own internship placement. Prior to registration, Global Health majors must meet with an advisor and complete internship verification, expectations and responsibilities. This is completed the semester prior to beginning the internship.

GBHL497 Global Health Capstone (3 Credits)
In this seminar course, Global Health majors in their final semester integrate and apply interdisciplinary knowledge, skills, and perspectives to address a global health challenge. Capstone projects may focus on research, system, policy analysis; or intervention development and assessment. Students will align their global health interests with their career goals, preparing for their next academic or professional steps.
Prerequisite: Minimum grade of C- in GBHL200, GBHL210, EPIB301 and EPIB315; and must have completed or be enrolled in second GBHL Experiential Learning course.
Restriction: Global Health major in final semester; and must have earned more than 100 credits.

GEMS - Gemstone

GEMS100 Freshman Honors Colloquium: Introduction to Gemstone (1 Credit)
Orienting new Gemstone students to the university and to the program through a variety of team building activities, resources, and skill exploration exercises. Students will also examine and discuss areas such as liberal education, diversity, service, arts, current events, academic integrity, and leadership style.
Restriction: Must be in the Gemstone program.

GEMS101 Introduction to Team Research (3 Credits)
An introduction to the basic concepts and tools needed to evaluate and conduct research. It sets the stage for the research lifecycle and teaches students what they need to know and do before embarking on research endeavors. Students will engage in the early stages of the research process and navigate the consumption and analysis of primary literature while working on interdisciplinary teams. They will undergo the iterative process of identifying gaps in the literature and think creatively about how a team of undergraduates could contribute to solving the world's grand challenges while recognizing constraints such as feasibility, timelines, budgets, novelty, and more. Students will learn skills for collaboration and navigating interdisciplinary teams and together will author and communicate components of a preliminary research proposal.
Restriction: Must be in the Gemstone program.

GEMS102 Research Topic Exploration and Team Formation (1 Credit)
Under the guidance of staff and visiting speakers, students will develop research topics that they will pursue for the remainder of their participation in the Gemstone program, and form into interdisciplinary teams around these topics.
Restriction: Must be in the Gemstone program.

GEMS104 Topics in Science, Technology and Society (STS) (3 Credits)
An examination of how cultural, economic, political and social forces shape scientific and technological systems and, conversely, how scientific and technological systems have affected the culture, economies, organization and politics of societies. Students in the course will form small teams to carry out semester-long research on socio/technical topics related to the course theme chosen for that specific semester.
Prerequisite: GEMS100.
Restriction: Must be in the Gemstone program.

GEMS202 Team Dynamics and Research Methodology (2 Credits)
This experiential course is designed to foster an understanding of effective team dynamics and basic research methodology. It will teach skills applicable to Gemstone team research and the writing of a team thesis. Upperclass Gemstone students serve as discussion facilitators. Students participate in their Gemstone teams and develop a draft of their team thesis proposal.
Prerequisite: GEMS100, GEMS102, and GEMS104.
Corequisite: GEMS296.
Restriction: Must be in the Gemstone program; and sophomore standing or higher.

GEMS208 Special Topics in Leadership and Team Development (1-3 Credits)
Principles, methods and types of leadership and team development with an emphasis on group discussion and decision making. Reading, discussion and exploration of the basic team concept, communications for winning scenarios, goal setting, problem solving, conflict resolution and research methods.
Restriction: Must be in the Gemstone program.

GEMS296 Team Project Seminar I (1 Credit)
This is the first of six seminars during which Gemstone students carry out multidisciplinary research with the guidance of a faculty mentor. The teams develop their working relationship, start their literature search, define their research question, and set short & long term goals.
Prerequisite: GEMS100, GEMS102, and GEMS104.
Corequisite: GEMS202.
Restriction: Must be in the Gemstone program with sophomore standing in a research team.

GEMS297 Team Project Seminar II (2 Credits)
This is the second of six seminars during which Gemstone students carry out interdisciplinary research with the guidance of a faculty mentor. The team develops its website, prepares and presents its research proposal and begins its research project.
Restriction: Must be in the Gemstone program with sophomore standing in a research team.

GEMS396 Team Project Seminar III (2 Credits)
This is the third of six seminars during which Gemstone students carry out interdisciplinary research with the guidance of a faculty mentor. The team presents its progress at the Gemstone Colloquia.
Prerequisite: GEMS297.
Restriction: Must be in the Gemstone program with junior standing in a research team.

GEMS397 Team Project Seminar IV (2 Credits)
This is the fourth of six seminars during which Gemstone students carry out interdisciplinary research with the guidance of a faculty mentor. The team further develops its website. Also they will prepare and present the team project in the poster session of Undergraduate Research Day.
Prerequisite: GEMS396.
Restriction: Must be in the Gemstone program with junior standing in a research team.

GEMS496 Project Writing Seminar (2 Credits)
This is the fifth of six seminars during which Gemstone students carry out research with the guidance of a faculty mentor. The team finishes the analysis of their data and writes and edits its team thesis.
Prerequisite: GEMS397.
Restriction: Must be in the Gemstone program.

GEMS497 Team Thesis Defense (2 Credits)
Gemstone teams will complete the team research project and thesis. The team will formally present the thesis to experts in the area of interest at a Team Thesis Conference before final submission.
Prerequisite: GEMS396.
Restriction: Must be in the Gemstone program.

GEOG - Geographical Sciences

GEOG100 Introduction to Geography (3 Credits)
An introduction to the broad field of geography as it is applicable to the general education student. The course presents the basic rationale of variations in human occupancy of the earth and stresses geographic concepts relevant to understanding world, regional and local issues.

GEOG110 The World Today: Global Perspectives (3 Credits)
The most critical issue facing the world today is the sustainability of both human and physical systems in the 21st century. This class uses the context of regions of the world to explore the 21st century issues of climate change, development, politics, economy, and demography. Each region will be used to highlight aspects of sustainability.

GEOG130 Development Geography: Environmental & Social Justice (3 Credits)
The geography of economic, social, and environmental well-being and inequality. The course will provide an integrated perspective on the causes, interconnections, and consequences across time and space of, among others, globalization, climate change, poverty, employment, migration and urban growth, agricultural productivity, rural development, policies and international trade. Portraits of selected countries and regions will be developed.

GEOG140 Natural Disasters: Earthquakes, Floods, and Fires (3 Credits)
Catastrophic Environmental Events (CCE) that are becoming more common in this time of global environmental change and it is essential that today's students be equipped with the knowledge and skills to be leaders as we, as a society, understand the upheaval that these CCEs are causing. Students will examine how CEEs shape human society and ecosystem from the interdisciplinary perspective afforded by the field of Geography. Students will use the latest geographic science concepts and techniques in exploring these events. Using satellite imagery they will gain a multi-scale perspective of the ecological and societal aspects of the events.

GEOG156 How NASA Sees the Earth (3 Credits)
The world of Earth science data is complex and can be overwhelming with a wide range of data sources and formats, hefty downloads and the need for complicated analytical tools. To make use of enormous volumes of available data and geoinformation products, one has to know where and how to search and obtain the data, how to analyze the data, and how to extract useful information and knowledge. In this course, you will learn about the state-of-the-art Web-based tools that allow you to efficiently display and analyze a large number of datasets in a way many professionals working in the Earth science domain would. You will learn how to visualize multiple Earth science datasets produced by NASA in a variety of ways directly on the Internet, without the need to download, manage and store them. Students will be introduced to comprehensive functions to analyze the data and generate customized maps, animations, multi-variable correlations, regional subsetting, etc.
Cross-listed with: INST156.
Credit Only Granted for: GEOG156 or INST156.

GEOG158 Special Topics in Study Abroad I (1-6 Credits)
Special topics course taken as part of an approved study abroad program.
Repeatable to: 15 credits if content differs.

GEOG170 Mapping our Digital World (3 Credits)
Introduction to technical methods used in gathering, analyzing, and mapping geospatial information for applications such as urban mobility, environmental monitoring, situational awareness, and disaster management. Topics include Geographic Information Systems (GIS), cartography, map projections, satellite and airborne remote sensing, the global positioning system (GPS), and introductory statistics and probability. The course is a gateway to more advanced technical classes in geospatial science.

GEOG172 Earth From Space (3 Credits)
Earth observations from space enable the mapping and monitoring of our changing planet. This survey course reviews current observational capabilities and examines scientific applications in quantifying global environmental change. Drivers and outcomes of key dynamics will be illustrated and discussed, including sea and continental ice loss, deforestation, ocean warming, urbanization, agricultural expansion and intensification, and vegetation response to climate change.

GEOG198 Selected Topics in Geography (1-3 Credits)
Readings and discussion on selected topics in the field of geography or GIS
Repeatable to: 12 credits if content differs.

GEOG201 Geography of Environmental Systems (3 Credits)
A systematic introduction to the processes and associated forms of the atmosphere and earth's surfaces emphasizing the interaction between climatology, hydrology and geomorphology.

GEOG202 Introduction to Human Geography (3 Credits)
Introduction to what geographers do and how they do it. Systematic study of issues regarding social and cultural systems from a global to a local scale. Looks at the distribution of these variables and answers the question "Why here, and not there"?

GEOG211 Geography of Environmental Systems Laboratory (1 Credit)
A laboratory course to accompany GEOG 201. Analysis of the components of the earth's energy balance using basic instrumentation; weather map interpretation; soil analysis; the application of map and air photo interpretation techniques to landform analysis.
Prerequisite: Must have completed or be concurrently enrolled in GEOL120, GEOL100, or GEOG201.

GEOG212 Career Planning for Geographical Sciences, GIS, and ENSP Majors (1 Credit)
Increase student knowledge of professional development opportunities in Geographical Sciences through classroom activities and invited speakers, and to build awareness of career development tools and strategies.
Restriction: Must be in one of the following programs (Geography; GEOG-GIS & Computer Cartography).

GEOG258 Special Topics in Study Abroad II (1-6 Credits)
Special topics course taken as part of an approved study abroad program.
Repeatable to: 15 credits if content differs.

GEOG272 Introduction to Earth Observation Science (3 Credits)
Concepts and principles of Earth observation and remote sensing in relation to photographic, thermal infrared and radar imaging. Methods of obtaining quantitative information from remotely-sensed images. Interpretation of remotely-sensed images emphasizing the study of spatial and environmental relationships.
Credit Only Granted for: GEOG272 or GEOG372.
Formerly: GEOG372.

GEOG276 Principles of Python Programming and Geocomputing (3 Credits)
Introduces conceptual and practical aspects of scientific computing using the Python programming language. The main focus is on developing proficiency for the basic elements of the development environment, foundational syntax including variables, logical operators, looping, conditional statements, nesting, and common programming patterns for mathematical and textual computing. In addition, essential data structures and functionality for scientific computing, such as arrays, dataframes, and data visualization will be introduced. Throughout the course, students will also become exposed to various applications in the domain of the social and environmental sciences.

GEOG298 Special Topics in Geography (3 Credits)
An introductory course dealing with special topics in geography.
Repeatable to: 6 credits if content differs.

GEOG301 Advanced Geographical Environmental Systems (3 Credits)
This course will provide the students with an overview of the key elements of physical geography, including biogeography (factors and processes that control the geographical distributions of plants and animals, climatology (processes associated with controlling variations in weather and climate), and geomorphology (factors and processes that control changes to the physical structure of the earth surface in relation to geological structures).
Prerequisite: GEOG201 and GEOG211.
Credit Only Granted for: GEOG398B or GEOG301.
Formerly: GEOG398B.

GEOG306 Introduction to Quantitative Methods for the Geographical Environmental Sciences (3 Credits)
Essentials in the quantitative analysis of spatial and other data, with a particular emphasis on statistics and programming. Topics include data display, data description and summary, statistical inference and significance tests, analysis of variance, correlation, regression, and some advanced concepts, such as matrix methods, principal component analysis, and spatial statistics. Students will develop expertise in data analysis using advanced statistical software.

GEOG328 Topics in Regional Geography (3 Credits)
Selected topics in regional geography.
Repeatable to: 6 credits if content differs.

GEOG330 As the World Turns: Society and Sustainability in a Time of Great Change (3 Credits)
Cultural geography course on society and sustainability. Culture is the basic building block that is key to sustainability of societies. Course will cover sustainability of societies on different scales, examining local, regional, and worldwide issues. Sustainability will be examined as a key element of environmental sustainability. How societies adjust to rapid world change will be examined as a positive and/or negative factor in sustainability.
Credit Only Granted for: GEOG330, GEOG360, or GEOG362.
Formerly: GEOG362.

GEOG331 Introduction to Human Dimensions of Global Change (3 Credits)
Introduction to global-scale interrelationship between human beings and the environment. The development of global issues including but not limited to the environment, food, energy, technology, population, and policy.
Prerequisite: ANTH220, ANTH260, GEOG202, or GEOG201; or permission of BSOS-Geography department.
Credit Only Granted for: GEOG331 or GEOG361.
Formerly: GEOG361.

GEOG332 Economic Geography (3 Credits)
Principles of managing scarce resources in a world where everyone faces tradeoffs across both time and space. Focuses on the relationship between globalization processes and changing patterns of locational advantages, production, trade, population, socioeconomic and environmental grace and sustainability.
Credit Only Granted for: GEOG203, GEOG303, or GEOG332.
Formerly: GEOG303.

GEOG333 The Social Geography of Metropolitan Areas in Global Perspective (3 Credits)
A socio-spatial approach to human interaction within the urban environments: ways people perceive, define, behave in, and structure world cities and metropolitan areas. Cultural and social differences define spatial patterns of social activities which further define distinctions in distribution and interaction of people and their social institutions.
Prerequisite: GEOG201 and GEOG202; or permission of BSOS-Geography department.
Credit Only Granted for: GEOG456 or GEOG333.
Formerly: GEOG456.

GEOG340 Geomorphology (3 Credits)
Survey of landform types and role of processes in their generation. Frequency of occurrence and implications for land utilization. Emphasis on coastal, fluvial, and glacial landforms in different environmental settings. Landform regions of Maryland.

GEOG346 Cycles in the Earth System (3 Credits)
The Earth System operates through some fundamental cycles such as water, energy, and the Carbon Cycle. This course will build on GEOL/GEOG/AOSC123 starting with concept of feedbacks within the Earth System, global energy balance and the Greenhouse Effect. A brief introduction to the atmospheric and oceanic circulation will lead to the water cycle connecting the land, ocean, and atmosphere to the Earth System. Introduction to the Global carbon, nitrogen, and sulfur cycles will be followed by the concept of long-term climate regulation and short-term climate variability. The concepts of cycles, feedbacks, forcings, and responses in the Earth System will be applied to Global Warming and Ozone Depletion.
Prerequisite: GEOG123, AOSC123, GEOL123, or MATH140; or permission of CMNS-Geology department.
Recommended: PHYS171, PHYS141, PHYS161, or MATH141. Cross-listed with GEOL346.
Credit Only Granted for: AOSC346, GEOG346, or GEOL346.

GEOG358 Special Topics in Study Abroad III (1-6 Credits)
Special topics course taken as part of an approved study abroad program.
Repeatable to: 15 credits if content differs.

GEOG371 Programming for Image Analysis (3 Credits)
Introduces application programing interface (API) functions and image processing techniques for efficient processing of satellite images. The main programing language of the course is Python. The course will use a Geospatial Data Abstraction Library (GDAL) which provides a unified way of manipulating images incorporating geospatial information. For image processing, the course will use Python-based libraries such as scikit-image and OpenCV.
Prerequisite: GEOG272.

GEOG373 Geographic Information Systems (3 Credits)
Characteristics and organization of geographic data; creation and use of digital geospatial databases; metadata; spatial data models for thematic mapping and map analysis; use of geographic information system in society, government, and business. Practical training with use of advanced software and geographic databases.

GEOG376 Programming for Geospatial Analysis (3 Credits)
Covers conceptual and practical aspects of geospatial data modeling and analysis techniques using the Python programming language. The main focus is on developing a solid understanding of the programmatic conventions needed to create, manipulate, and process geospatial data types, such as point, line, & polygon vectors, networks, trajectories, and space-time extensions. In addition, students will develop a proficiency in applying these data structures to perform automated geospatial analysis, such as GIS operations, agent-based models, and spatial statistics.
Prerequisite: GEOG276 and GEOG373; Must have completed or be concurrently enrolled in MATH120, MATH130, or MATH140; or must have completed MATH220.
Recommended: GEOG306.

GEOG377 Artificial Intelligence for Spatial Data (3 Credits)
An introductory course to spatial artificial intelligence (AI), providing a big picture of spatial AI applications (e.g., Google Maps, Uber/Lyft, Earth observation, smart cities, autonomous vehicles), techniques, platforms, trends, debates, etc. The course will cover basics of AI, identify challenges faced by AI techniques in the context of spatial data and applications, and introduce spatial-aware AI methods to address them. AI topics include but are not limited to: spatial data models and representation, machine learning, deep learning, navigation/planning, trends including large language models and foundation models for geospatial data, etc. Students are expected to have a broad understanding of spatial AI concepts, develop intuitions and insights to AI techniques, and have hands-on experience with Python at the end of the course.
Credit Only Granted for: GEOG398E or GEOG377.
Formerly: GEOG398E.

GEOG384 Internship in Geography I (3 Credits)
Supervised field training to provide career experience. Introduction to professional level activities, demands, opportunities. Placement at a public agency, non-profit organization, or private firm. Participation requires application to the internship advisor in preceding semester.
Prerequisite: GEOG211, GEOG306, GEOG212, and GEOG201; and (ENGL393 or ENGL390).
Restriction: Must be in Geography program.

GEOG385 Internship in Geography II (3 Credits)
Supervised field training to provide career experience. Introduction to professional-level activities, demands, opportunities. Placement at a public agency, nonprofit organization, or private firm. Participation requires application to the internship advisor in preceding semester.
Prerequisite: GEOG211, GEOG306, GEOG212, and GEOG201; and must have completed a Junior (Professional) English course.
Restriction: Must be in Geography program.

GEOG396 Honors Research (3 Credits)
First course in the departmental honors sequence. Student development of a potential research topic under the guidance of a faculty advisor, culminating in a written and oral presentation of a research proposal.
Restriction: Permission of BSOS-Geography department; and senior standing or higher; and must be in Geography program.
Formerly: GEOG397.

GEOG397 Honors Thesis (3 Credits)
Second course in the departmental honors sequence. Student research under the auspices of a faculty advisor, culminating in a research paper to be defended orally before the geography honors committee.
Prerequisite: GEOG396.
Restriction: Must be in Geography program; and senior standing or higher.
Formerly: GEOG399.

GEOG398 Special Topics in Geography (1-3 Credits)
An introductory course dealing with special topics in geography.
Restriction: Permission of BSOS-Geography department.
Repeatable to: 6 credits if content differs.
Credit Only Granted for: GEOG298 or GEOG398.
Formerly: GEOG298.

GEOG413 Migration: Latin America and the United States (3 Credits)
Develops an understanding of the push and pull factors that have contributed to human mobility (migration) that has transformed the Americas. The class is divided in two parts: immigration and emigration from Latin American and Latin America migration to the United States. We will be interested in studying the migration shifts that have occurred in Latin America and the theories that help explain them. The themes that will be addressed are the history of migration with Latin America and to North America, the impact of this migration on both sending and receiving countries, and the various policy strategies and issues concerning migration.
Prerequisite: GEOG313; or permission of BSOS-Geography department.
Recommended: HIST250; or USLT201; or LASC234.
Credit Only Granted for: GEOG413, or GEOG498M.
Formerly: GEOG498M.

GEOG415 Land Use, Climate Change, and Sustainability (3 Credits)
The issues of climate change and land use change as two interlinked global and regional environmental issues and their implications for society and resource use are explored.
Prerequisite: GEOG201.

GEOG416 Conceptualizing and Modeling Human-Environmental Interactions (3 Credits)
Develops skills to carry out research that integrates environmental and economic aspects of sustainability by introducing extensively used quantitative tools for analyzing human-environmental interactions in the field of ecological economics. These include, e.g., index number calculations and decomposition analysis, Environmental Kuznets Curve (EKC), environmental input-output analysis and life-cycle analysis, and multi-criteria decisions aid (MCDA). Students will need laptops to run models during class.
Prerequisite: Permission of BSOS-Geography department.
Corequisite: MATH130, MATH140, or MATH120; or MATH220.

GEOG417 Land Cover Characterization Using Multi-Spectral Remotely Sensed Data Sets (3 Credits)
Students will be introduced to the image processing steps required for characterizing land cover extent and change. Key components of land cover characterization, including image interpretation, algorithm implementation, feature space selection, thematic output definition, and scripting will be discussed and implemented.
Prerequisite: GEOG272 or permission of instructor.
Jointly offered with: GEOG617.
Credit Only Granted for: GEOG417 or GEOG617.

GEOG418 Field and Laboratory Techniques in Environmental Science (1-3 Credits)
Lecture and laboratory learning each week. A variable credit course that introduces field and laboratory analyses in environmental science. Individual learning contract are developed with instructor.
Restriction: Permission of BSOS-Geography department.
Credit Only Granted for: GEOG418 or GEOG448.
Formerly: GEOG448.

GEOG421 Changing Geographies of China (3 Credits)
Covers physical geography, history, and economic and political systems of the world's most populous country. The major focus will be on geographical issues in China's contemporary development: agriculture, population, urbanization, resource and energy, and environment.
Prerequisite: Permission of BSOS-Geography department. Or GEOG202; and GEOG201; and (GEOG435, GEOG333, or GEOG332).
Recommended: GEOG130; or GEOG140.
Credit Only Granted for: GEOG328B or GEOG421.
Formerly: GEOG328B.

GEOG422 Changing Geographies of Sub-Saharan Africa (3 Credits)
Students will develop an understanding of the geographic contexts of SubSaharan Africa, including an overview of the physical, bioclimatic, historical, cultural, political, demographic, health and economic geographies of Sub-Saharan Africa. Students will fill in the map of Africa by studying the spatial distribution within each of these geographic domains. In addition to an overview of geography South of the Sahara, the Congo will be taken as a more intensive case study through additional readings, lectures and discussions.
Prerequisite: GEOG201.
Recommended: GEOG130 or GEOG110.
Credit Only Granted for: GEOG422 or GEOG788A.

GEOG423 Latin America (3 Credits)
A geography of Latin America and the Caribbean in the contemporary world: political and cultural regions, population and natural resource distribution, economic and social development, poverty, crime, urbanization, migration trends, and natural disasters.
Prerequisite: Permission of BSOS-Geography department. Or GEOG201 and GEOG202; and (GEOG332, GEOG435, or GEOG333).
Recommended: GEOG130 and GEOG110.
Credit Only Granted for: GEOG313 or GEOG423.
Formerly: GEOG313.

GEOG431 Culture and Natural Resource Management (3 Credits)
Basic issues concerning the natural history of humans from the perspective of the geographer. Basic components of selected behavioral and natural systems, their evolution and adaptation, and survival strategies.
Credit Only Granted for: GEOG421 or GEOG431.
Formerly: GEOG421.

GEOG432 Spatial Econometrics (3 Credits)
An introduction to modern econometric techniques in general and spatial econometrics in particular, using the popular open source statistical computer language R. A focus on using statistical computing to produce analytical reports for real-world applications, research papers, and dissertations.
Prerequisite: Permission of BSOS-Geography department.
Jointly offered with: GEOG732.
Credit Only Granted for: GEOG432 or GEOG732.

GEOG438 Seminar in Human Geography (3 Credits)
Selected topics in human geography.
Recommended: GEOG201; or GEOG211.
Restriction: Permission of BSOS-Geography department.
Repeatable to: 6 credits if content differs.

GEOG440 Polar Remote Sensing (3 Credits)
The harsh environment of the vast polar regions makes them some of the most inaccessible places on Earth. With widespread environmental change already underway, satellite remote sensing provides the only means by which to obtain year-round observations of the polar climate system. The objective of this course is to provide students with an overview of polar remote sensing techniques, including the physical principles of active and passive sensors, orbits, electromagnetic radiation, atmospheric transmission, calibration and validation. We will focus on measurements of the polar oceans, sea ice, glaciers, ice sheets, snow and permafrost, and examine the response of the cryosphere to climate change.
Prerequisite: PHYS171 or PHYS161; and AOSC401 or GEOG301; or with permission of instructor.
Cross-listed with: AOSC440.
Jointly offered with: AOSC642.
Credit Only Granted for: AOSC440, GEOG440, AOSC642, or GEOG640.

GEOG441 The Coastal Ocean (3 Credits)
Introduction to coastal oceanography, focusing on the physical, biological, and geological aspects of ocean areqs on the inner continental shelves. Wave, currents, and tidal dynamics of bays, open coast, estuaries, and deltas. Sedimentary environments of major coastal types. Ecology and biogeochemical relationships, including benthic and planktonic characteristics. Coastal evolution with sea level rise. Human impacts: eutrophication, modification of sedimentation. The coastal future: rising sea level, hypoxia, and increased storminess.
Prerequisite: GEOG201.

GEOG442 Biogeography and Environmental Change (3 Credits)
Biogeographical topics of global significance, including a consideration of measurement techniques, and both descriptive and mechanistic modeling. Topics may include: scale in biogeography, biodiversity, carbon geography, climate and vegetation, interannual variability in the biosphere, land cover, global biospheric responses to climate change, NASA's Mission to Planet Earth and Earth Observation System. The class focuses on both natural and athropogenic controls, impacts of biography on climate and ecosystem services and different methods in biogeography.
Prerequisite: GEOG201.
Jointly offered with: GEOG642.
Credit Only Granted for: GEOG642 or GEOG442.

GEOG458 Special Topics in Study Abroad IV (1-6 Credits)
Special topics course taken as part of an approved study abroad program.
Repeatable to: 15 credits if content differs.

GEOG461 Machine Learning for Computational Earth Observation Science (CEOS) (3 Credits)
Provides an introduction to machine learning methods and models with an emphasis on Earth observation. Topics will include supervised (decision trees, random forest, neural networks, support vector machine, Gaussian process and ensemble techniques), and unsupervised techniques (clustering/segmentation, dimension reduction, multi-dimensional data visualization). The course will highlight the state-of-the-art deep learning models; object-based versus pixel-based image classification; how to deal with missing data and non-uniform coverage of data; and large scale land cover land use mapping from heterogenous satellite data. Practical part will include satellite image classification by applying classification models and biophysical parameters retrieval by applying regression models.
Prerequisite: GEOG272.

GEOG470 Algorithms for Geospatial Computing (3 Credits)
An introduction to fundamental geospatial objects and geometric algorithms for spatio-temporal data processing and analysis. Point data representation and analysis: spatial data models and data structures, algorithms for spatial queries, point clustering algorithms. Surface and scalar field modeling, such as terrains: raster and triangle-based models (TINs), algorithms for building and querying TINs. Algorithms for natural and urban terrain analysis: morphology computation and visibility analysis. Applications to processing and analysis of LiDAR (Light Detection And Ranging) data in the context of terrain reconstruction, urban modeling, forest management and bathymetry reconstruction for coastal data management. Road network computation and analysis: algorithms for route computation in road networks, and for road network reconstruction from GPS and satellite data.
Prerequisite: GEOG276; or a minimum grade of C- in CMSC330 and CMSC351; or permission of instructor.
Cross-listed with: CMSC401.
Jointly offered with: GEOG770.
Credit Only Granted for: CMSC498Q, CMSC401, CMSC788I, GEOG470, GEOG498I, GEOG770, or GEOG788I.
Formerly: GEOG498I.

GEOG471 Technologies for Computational Earth Observations (3 Credits)
An introduction and exploration of cutting-edge novel remote sensing datasets and their associated science uses and applications. We present several modules focused on different technologies (multispectral, lidar, radar, thermal), and for each have both hands-on lab assignments, lectures, and applications case studies. Data fusion techniques, and common analysis and processing pitfalls are presented and discussed. Hands-on computer labs allow students to explore each dataset via online tutorials. After all datasets are presented, students download their own datasets in an area of interest to them, and work toward a unique student-driven project for presentation to the class. The sky is literally the limit in this interactive course which provides a research experience opportunity for students in a supportive atmosphere.
Prerequisite: GEOG371 or permission of instructor.

GEOG472 Remote Sensing: Digital Processing and Analysis (3 Credits)
Digital image processing and analysis applied to satellite and aircraft land remote sensing data. Consideration is given to image preprocessing techniques including radiometric calibration, geometric registration as well as atmospheric correction. Analysis methods include digital image exploration, feature extraction, thematic classification, change detection, and biophysical characterization. An application-oriented course project will be completed through the self-guided computer labs.
Prerequisite: GEOG272.
Recommended: GEOG371, GEOG306 or equivalent.

GEOG473 Geographic Information Systems and Spatial Analysis (3 Credits)
Analytical uses of geographic information systems; data models for building geographic data bases; types of geographic data and spatial problems; practical experience using advanced software for thematic domains such as terrain analysis, land suitability modeling, demographic analysis, and transportation studies.
Prerequisite: GEOG306 and GEOG373; or students who have taken courses with comparable content may contact the department.
Credit Only Granted for: GEOG473 or GEOG482.
Formerly: GEOG482.

GEOG475 Geographic Visualization and Digital Mapping (3 Credits)
An overview of the basic concepts and techniques that underlie digital map making and the broader field of geographic visualization for intermediate GIS users. This includes the use of color, map symbolization, map layout, and also the contribution to geographic visualization from the fields of scientific visualization, information visualization, and cognition. Fundamentals of dynamic map design and web mapping will be introduced through the use of animated and interactive maps.
Prerequisite: GEOG373 and GEOG306.

GEOG476 Object-Oriented Computer Programming for GIS (3 Credits)
Expands on conceptual and practical aspects of programming for geographic applications. The main focus of this course is to provide students more advanced programming in object oriented programming languages (i.e. Python). In addition, students will develop a proficiency in applying these advanced programming principles to manipulating spatial data sources within the Geographic Information Systems (GIS).
Prerequisite: GEOG373 and GEOG376; or permission of BSOS-Geography department. And must have completed MATH220; or must have completed or be concurrently enrolled in MATH120, MATH130, or MATH140.
Restriction: Must be in Geography program; or must be in GIS minor.

GEOG498 Topical Investigations (1-3 Credits)
Independent study under individual guidance.
Prerequisite: Restricted to advanced undergraduate students; and 24 credits in GEOG courses. Or restricted to graduate students.
Repeatable to: 6 credits if content differs.

GEOL - Geology

GEOL100 Physical Geology (3 Credits)
A general survey of the rocks and minerals composing the earth, its surface features and the agents that form them, and the dynamic forces of plate tectonics.
Credit Only Granted for: GEOL100 or GEOL120.
Additional Information: CORE Distributive Studies Physical Science Laboratory Course only when taken concurrently with GEOL 110.

GEOL102 Historical Geology (4 Credits)
Earth's history as revealed through the principles of stratigraphy and the processes of physical geology. Emphasis on formations and geologic development of the North American continent.
Prerequisite: GEOL120 or GEOL100; and GEOL110. Or permission of CMNS-Geology department.

GEOL104 Dinosaurs: A Natural History (3 Credits)
Dinosaurs, their evolution, and our understanding of their fossil record. Students will examine the geologic record and the tools used by paleontologists to determine: geologic ages and ancient environments; evolutionary history and extinctions; dinosaurian biology and behavior; and their survival as birds. Mechanisms of global change ranging from plate tectonics to asteroid impact will be discussed.

GEOL110 Physical Geology Laboratory (1 Credit)
The basic materials and tools of physical geology stressing familiarization with rocks and minerals and the use of maps in geologic interpretations.
Prerequisite: Must have completed or be concurrently enrolled in GEOL120 or GEOL100.

GEOL120 Environmental Geology (3 Credits)
A review of geologic factors underlying many environmental problems and the interactions between population and physical environment: geologic hazards, land-use planning, conservation, mineral resources, waste disposal, land reclamation, and the geologic aspects of health and disease. The course is aimed at lower division students in education and liberal arts, and should be useful to any student concerned with geologic perspectives of environmental problems.
Credit Only Granted for: GEOL100 or GEOL120.

GEOL123 Causes and Consequences of Global Change (3 Credits)
Study of the major components of Earth's climate system and climate change history. Discussion of 21st century climate change prediction, mitigation and adaptation efforts.
Cross-listed with: AOSC123.
Credit Only Granted for: AOSC123, GEOG123, or GEOL123.

GEOL124 Evolution of Life and Environment on Planet Earth (3 Credits)
An exploration of how life has shaped Earth's physical environments, both in the contemporary Earth and over the long course of Earth history. Topics range from evidence for the origin and diversification of life and its impact on Earth environments to the mind-set and methods of the scientists who interpret it, and what those methods tell us about future interactions between life and the environment, both on Earth and in the Solar System.

GEOL200 Earth's Fury: Earthquakes, Volcanoes, and Tsunami (3 Credits)
Earthquakes, volcanic eruptions, and tsunami frequently remind us of the dangers associated with living on a constantly changing planet. How do people prepare for these rare but dramatic events? Student will study the science behind earthquakes and volcanoes, how it guides monitoring, forecasting, prevention, and response, and the cultural and ethical aspects of these events.

GEOL204 Dinosaurs, Early Humans, Ancestors, and Evolution; The Fossil Record of Vanished Worlds of the Prehistoric Past (3 Credits)
What good is the fossil record? What relevance or insights might the remains of ancient living things have for our modern world? This course examines how the record of ancient life was made, and how we use diverse scientific techniques to reveal the information it contains. We will look at how the various inhabitants of our planet changed through time, and how different ecosystems such as reefs, forests, and grasslands were assembled. We will see how our own species came to be, and of our spread across the world from our ancestral home in Africa. We'll examine how the fossil record contains evidence of climate changes and extinction events far exceeding what we are currently experiencing, and how we can use these as warnings for our future. We'll address who are the owners and stakeholders in the evidence of the fossil world. Students will learn how to read and interpret the primary scientific literature, and how to present scientific information to others through various media.

GEOL212 Planetary Geology (3 Credits)
An examination of the geologic and geochemical processes at work in the solar system from the perspectives supplied by space age exploration of the planets and other solar system bodies.
Credit Only Granted for: ASTR330 or GEOL212.

GEOL224 Observations and Measurements of the Natural World (3 Credits)
A scientific research team experience focused on evaluating environmental controls on water quality in urbanized streams of College Park. Training in field, laboratory, and digital visualization techniques to gain hands on knowledge of the scientific method through detailed observations, measurements, manipulations, and interpretations of data gathered during the course.

GEOL288 Field Studies I (1 Credit)
Examination and investigation of Earth Science phenomena in the field, particularly geology. Involves fieldwork of one week or longer duration, which work normally includes both observation and data collection. Particular programs may require certain prerequisites. Permission of Instructor is required. Special fees may be necessary.
Repeatable to: 3 credits if content differs.

GEOL322 Mineralogy (4 Credits)
Basic mineralogy for geology majors. The principles of morphologic crystallography, crystal chemistry, and determinative mineralogy.
Prerequisite: GEOL120 or GEOL100; and GEOL110. And CHEM131 and CHEM132; or (CHEM135 and CHEM136); or CHEM103.
Restriction: Permission of instructor is required for non-degree seeking students.

GEOL329 Instructional Assistance Practicum (1-2 Credits)
Undergraduate teaching assistantship in Geosciences. Individual instruction course. Contact department or instructor to obtain section number.

GEOL331 Principles of Paleontology (4 Credits)
A review of the theory, principles, and applications of Paleontology. A systematic overview of the morphology, evolution, and relationships of the major fossil-producing taxa.
Prerequisite: GEOL102; or (BSCI207 or BSCI392); or permission of CMNS-Geology department.
Cross-listed with: BSCI333.
Restriction: Permission of instructor is required of non-degree seeking students.
Credit Only Granted for: GEOL331 or BSCI333.

GEOL340 Geomorphology (4 Credits)
Analysis of landforms, organized on the basis of the geologic processes that have operated during the late Cenozoic. Constructional and erosional landforms related to physical systems operating on geologic structures through time.
Prerequisite: GEOL120 or GEOL100.
Restriction: Permission of instructor is required of non-degree seeking students.

GEOL341 Structural Geology (4 Credits)
Study of the deformation of Earth's lithosphere, especially stress, rheology, strain, and the origin and significance of structural features. Development of 3-dimensional thinking through drafting and drawing of structures, construction of geologic maps and cross-sections, and stereographic and orthographic representation of structures. Improvement of scientific writing. Two weekend field trips.
Prerequisite: GEOL120 or GEOL100; and GEOL102; and GEOL110. Or permission of CMNS-Geology department.
Restriction: Permission of instructor is required of non-degree seeking students.

GEOL342 Sedimentation and Stratigraphy (4 Credits)
Description, origin, and distribution of sediments and sedimentary rocks.
Prerequisite: GEOL120 or GEOL100; and GEOL110; and GEOL322. And CHEM103; or (CHEM131 and CHEM132); or (CHEM135 and CHEM136).
Restriction: Permission of instructor is required of non-degree-seeking students.

GEOL346 Cycles in the Earth System (3 Credits)
The Earth System operates through some fundamental cycles such as water, energy, and the Carbon Cycle. This course will build on GEOL/GEOG/AOSC123 starting with concept of feedbacks within the Earth System, global energy balance and the Greenhouse Effect. A brief introduction to the atmospheric and oceanic circulation will lead to the water cycle connecting the land, ocean, and atmosphere to the Earth System. Introduction to the Global carbon, nitrogen, and sulfur cycles will be followed by the concept of long-term climate regulation and short-term climate variability. The concepts of cycles, feedbacks, forcings, and responses in the Earth System will be applied to Global Warming and Ozone Depletion.
Prerequisite: MATH140; and (GEOG123, AOSC123, or GEOL123). Or permission of CMNS-Geology department.
Recommended: PHYS171, PHYS141, PHYS161, or MATH141.
Restriction: Non-degree-seeking students require the permission of the instructor. Cross-listed with GEOG346.
Credit Only Granted for: AOSC346, GEOG346, or GEOL346.

GEOL351 Statistics for Geoscientists (3 Credits)
Practical approach to basic statistics applied in the geosciences. Experimental design, elementary statistics and probability, sequence analysis, spatial analysis, linear regression, nonparametric statistics, bivariate, multivariate and principal components analysis of variance, hypothesis testing. Problem sets and participatory discussion of statistical applications in the current literature.
Prerequisite: MATH115.
Restriction: Non-degree-seeking students require the permission of the instructor.

GEOL375 Introduction to the Blue Ocean (3 Credits)
The global ocean is a major component of the Earth System that shapes life on earth, including our weather and climate. We explore the observation-based interdisciplinary science of oceanography, identifying its strong connections to related sciences like meteorology, and geography. We apply this developing understanding to environmental issues such as marine pollution, fish and fisheries, as well as to climate variability and to the changes to the marine environment that are resulting from steadily rising levels of atmospheric greenhouse gasses. Focusses include the biogeochemical and physical changes we can observe in the nearby Chesapeake Bay and the coastal waters of Eastern Shore, Maryland.
Prerequisite: MATH120 or higher.
Recommended: MATH121, MATH141, PHYS161, or PHYS171.
Cross-listed with: AOSC375.
Credit Only Granted for: AOSC375 or GEOL375.

GEOL386 Experiential Learning (3-6 Credits)
Prerequisite: Permission of CMNS-Geology department.
Restriction: Junior standing or higher.

GEOL388 Field Studies II (3 Credits)
Examination and investigation of Earth Science phenomena in the field, particularly geology. Involves field work of one week or a longer duration, which would normally involve both observations and data collection, with associated classroom lectures and/or laboratory study, normally including additional analysis of collected observations and data. Particular programs may require certain prerequisites. Permission of instructor required. Special fees may be necessary.
Restriction: Non-degree-seeking students require the permission of the instructor.
Repeatable to: 6 credits if content differs.

GEOL391 Biology of Extinct Animals (3 Credits)
A survey of extinct animals that have few, if any, direct living descendants. The principles governing the functional design of animals will be used to infer life styles for extinct, and frequently bizarre, organisms.
Prerequisite: BSCI160 and BSCI161; or BSCI106.
Cross-listed with: BSCI392.
Credit Only Granted for: GEOL391 or BSCI392.

GEOL392 Biology of Extinct Animals Laboratory (1 Credit)
An overview of the techniques used in paleobiological reconstructions of extinct animals.
Prerequisite: Must have completed or be concurrently enrolled in BSCI392.
Cross-listed with: BSCI393.
Credit Only Granted for: GEOL392 or BSCI393.

GEOL393 Geology Senior Thesis I: Proposal (3 Credits)
The first semester of the two-semester Geology Senior Thesis. Emphasis is on developing a plan for original research in the geosciences and presenting that plan both in writing and in public presentations that adhere to geosciences professional standards.
Prerequisite: PHYS141 or (PHYS161 and PHYS174); and MATH141; and (CHEM131 and CHEM132) or (CHEM135 and CHEM136); and must have completed at least two upper-level geology courses and be concurrently enrolled in a third.
Restriction: Junior standing or higher; and must be in Geology program.

GEOL394 Geology Senior Thesis II: Research (3 Credits)
The second semester of the two-semester Geology Senior Thesis. Investigation of specific original research question in geosciences. Emphasis is on completion of original research proposed in GEOL393 and presentation of results both in writing and in public presentations that adhere to geosciences professional standards.
Prerequisite: GEOL393; and must have completed at least three upper level GEOL courses.
Restriction: Must be in Geology program; and junior standing or higher.

GEOL412 Geology of the Terrestrial Planets (3 Credits)
Geological features of Mercury, Venus, Mars and the Moon with an emphasis on results from recent NASA planetary mission. Topics include interior structure, impact cratering, tectonic and volcanic history, surface conditions, climate change, and habitability.
Prerequisite: GEOL341 or GEOL340.
Credit Only Granted for: GEOL489A or GEOL412.
Formerly: GEOL489A.

GEOL413 Geoscientific Modeling (3 Credits)
A model is a simplified representation of reality. Modeling is implicit or explicit in almost everything we do as geoscientists. Model construction, coding, and the concepts of parsimony vs complexity, robustness, validation, uncertainty, and the scientific interpretation of simulation results. Problem sets, independent study and participatory discussion of modeling applications in the current literature.
Prerequisite: MATH115; and two 400-level GEOL courses.
Recommended: Some experience in computer programming.
Jointly offered with: GEOL613.
Restriction: Non-degree-seeking students require the permission of the instructor.
Credit Only Granted for: GEOL413, GEOL489G, GEOL613 or GEOL789G.
Formerly: GEOL489G.

GEOL423 Optical Mineralogy (4 Credits)
The optical behavior of crystals with emphasis on the theory and application of the petrographic microscope.
Prerequisite: GEOL100 or GEOL120; and GEOL110; and GEOL322. And CHEM131 and CHEM132; or (CHEM135 and CHEM136); or CHEM103.
Restriction: Non-degree-seeking students require the permission of the instructor.

GEOL431 Vertebrate Paleobiology (4 Credits)
A survey of the evolution of the vertebrates, encompassing information from the diversity of living members, but concentrating on the contribution of the fossil record. Emphasis is on the phylogenetic systematics, comparative and functional anatomy, developmental biology, and stratigraphic distribution of major extinct and extant groups.
Prerequisite: BSCI207, BSCI392, GEOL104, GEOL204, or GEOL331; or permission of CMNS-Geology department.

GEOL435 Environmental Geochemistry (3 Credits)
An understanding of geochemical cycles of Earth's surface systems including soils, rivers, lakes, and estuaries and causes and implications of alteration of geochemical cycles. Topics include chemical weathering, soils, chemical composition of inland waters, hydrologic tracers, salinization, eutrophication, nutrient and metal pollution, and global geochemical cycles.
Prerequisite: MATH115; and (GEOL100 or GEOL120); and (GEOL436 or GEOL444). And CHEM131 and CHEM132; or (CHEM135 and CHEM136).
Restriction: Nondegree-seeking students require the permission of the instructor.
Credit Only Granted for: GEOL489W or GEOL435.
Formerly: GEOL489W.

GEOL436 Principles of Biogeochemistry (3 Credits)
An introduction to the basic principles of biogeochemistry including aspects of organic geochemistry, biochemistry, microbiology, global geochemical cycles, the origin of life and paleoenvironmental evolution.
Prerequisite: MATH120 or MATH140; or must have completed MATH220. And (GEOL100 or GEOL120); and GEOL322. And CHEM131 and CHEM132; or (CHEM135 and CHEM136).
Cross-listed with: AOSC436.
Restriction: Non-degree-seeking students require the permission of the instructor.
Credit Only Granted for: GEOL436 or AOSC436.

GEOL437 Global Climate Change: Past and Present (3 Credits)
Introduction to the processes by which climate varies, the paleoclimate record, and projections of climate change into the 21st century, including discussion of climate sensitivity to external radiative forcing.
Prerequisite: MATH115 or MATH140; and (GEOL100 or GEOL120); and (CHEM131 or CHEM135); and (CHEM132 or CHEM136).
Cross-listed with: AOSC437.
Jointly offered with: GEOL637, AOSC685.
Credit Only Granted for: GEOL437, GEOL637, AOSC437 or AOSC685.

GEOL443 Petrology (4 Credits)
Study of igneous and metamorphic rocks: petrogenesis, distributions, chemical and mineralogical relations, macroscopic and microscopic descriptions, geologic significance.
Prerequisite: GEOL322. And CHEM131 and CHEM132; or (CHEM135 and CHEM136); or CHEM103. And must have completed or be concurrently enrolled in GEOL423; and (GEOL100 or GEOL120); and GEOL110.
Corequisite: Permission of CMNS-Geology department.
Restriction: Non-degree-seeking students require the permission of the instructor.

GEOL444 Low Temperature Geochemistry (4 Credits)
Basic chemical principles, thermodynamics, and kinetics of low-temperature inorganic and organic geochemical reactions in a wide range of surface environments. These geochemical tools will be used to provide a context for understanding elemental cycling and climate change. Laboratories will include problem sets as well as wet chemical and mass spectrometric techniques used in low temperature geochemistry.
Prerequisite: GEOL322, GEOL100, and MATH115. And CHEM103; or (CHEM131 and CHEM132); or (CHEM135 and CHEM136).
Restriction: Non-degree-seeking students require the permission of the instructor.

GEOL445 High Temperature Geochemistry (4 Credits)
Review of chemical principles and their use in understanding processes of Earth, and solar system formation and differentiation. Topics include nucleosynthesis and cosmochemical abundances of elements, bonding and element partitioning, equilibrium thermodynamics and phase stabilities, radiogenic isotopes and geochronology, kinetics, and diffusion.
Prerequisite: GEOL322, GEOL100, and MATH115. And CHEM131 and CHEM132; or (CHEM135 and CHEM136); or CHEM103.
Restriction: Non-degree-seeking students require the permission of the instructor.

GEOL446 Geophysics (3 Credits)
An introduction to modern geophysics. Topics include: global plate tectonics, plate motion, triple junctions, geomagnetism, earthquakes and faulting, reflection and refraction seismology, gravity and isostasy, heat flow and mantle dynamics, deep interior of the Earth, geophysical observations and measurements.
Prerequisite: PHYS141, MATH141, and MATH140; and (GEOL100 or GEOL120).
Restriction: Non-degree-seeking students require the permission of the instructor.

GEOL447 Observational Geophysics (3 Credits)
An introduction to practical signal processing, data analysis, and inverse theory in geophysics.
Prerequisite: MATH140 and MATH141; and (PHYS141, PHYS161, or PHYS171).

GEOL451 Groundwater (3 Credits)
An introduction to the basic geologic parameters associated with the hydrologic cycle. Problems in the accumulation, distribution, and movement of groundwater will be analyzed.
Prerequisite: GEOL110 and MATH140; and (GEOL120 or GEOL100); and (CHEM131 and CHEM132; or (CHEM135 and CHEM136); or CHEM103). Or permission of CMNS-Geology department.
Restriction: Non-degree-seeking students require the permission of the instructor; and junior standing or higher.

GEOL452 Watershed and Wetland Hydrology (3 Credits)
Physical processes by which water moves in watershed and wetland systems. Topics include: precipitation, infiltration, flow in the unsaturated zone, streamflow generation processes, and groundwater flow.
Restriction: Junior standing or higher; and all other students require the permission of the instructor.

GEOL453 Ecosystem Restoration (3 Credits)
Overview of ecosystem functions across biomes/geologic settings, and considerations and tradeoffs in ecosystem restoration strategies. Specific case studies and discussions will be aimed at understanding how structure can influence biophysical and biogeochemical processes supporting ecosystems, and then describes how rates, timing, and location of physical, chemical, and ecosystem processes can be altered by different restoration strategies to enhance ecosystem services.
Prerequisite: MATH120 or MATH140; or must have completed MATH220. And (CHEM131 or CHEM135); and (CHEM132 or CHEM136); and (GEOL100, GEOL120, or ENST200).
Restriction: Junior standing or higher; and permission of instructor is required of non-degree-seeking students.
Credit Only Granted for: GEOL453 or GEOL489L.
Formerly: GEOL489L.

GEOL455 Marine Geophysics (3 Credits)
Plate tectonics, earthquakes and faulting, isostasy and gravity, heat and mantle dynamics, ocean ridges and transform faults, hydrothermal vents, trenches and oceanic islands, subduction zones, accretionary and erosion wedges, sedimentary basins and continental rifts. Exploration of the oceans using geophysical methods.
Prerequisite: MATH141 and MATH140; and (GEOL120 or GEOL100). Or permission of CMNS-Geology department.
Restriction: Non-degree-seeking students require the permission of the instructor.
Credit Only Granted for: GEOL455 or GEOL489E.
Formerly: GEOL489E.

GEOL456 Engineering Geology (3 Credits)
An overview of engineering geology with an emphasis on physical understanding of natural hazards and natural resources. General theories of stress and strain, failure criteria, frictional stability, fluid flow in porous media and poroelasticity are introduced. Quantitative approaches on earthquakes, landslides, land subsidence, and geotechnical aspects of oil/gas exploration are discussed.
Prerequisite: PHYS141 and MATH141; and (GEOL120 or GEOL100). Or permission of CMNS-Geology department.
Restriction: Non-degree-seeking students require the permission of the instructor.
Credit Only Granted for: GEOL456 or GEOL489Z.
Formerly: GEOL489Z.

GEOL457 Seismology (3 Credits)
General overview of the basics of seismology, starting with wave propagation, seismic reflection and refraction. Applications to the determination of the seismic velocity and anisotropy structure of the Earth. Earthquake generation, postseismic deformation and creep events, relation to faulting and plate tectonics.
Prerequisite: GEOL120 or GEOL100; and (MATH141, GEOL110, and MATH140). Or permission of CMNS-Geology department.
Recommended: PHYS171, PHYS141, or PHYS161.
Restriction: Non-degree-seeking students require the permission of the instructor.
Credit Only Granted for: GEOL457 or GEOL489A.
Formerly: GEOL489A.

GEOL460 Field Geophysics (4 Credits)
Students will become familiar with geophysical instrumentation used for both scientific and industrial applications. Students will be given an introduction to the use of geophysical instrumentation for data collection, processing, and analysis, design of field experiments for investigating field geophysical problems, and an introduction to the theory of instrument design and use. Instruments that will be covered include (but are not limited to): broadband seismometers, geophones, ground-penetrating radar, magnetotellurics, and Global Positioning Satellites.
Prerequisite: GEOL100 or GEOL120, MATH140, MATH141, and (PHYS141, PHYS161, or PHYS171).
Restriction: Non-degree-seeking students require the permission of the instructor.

GEOL463 Economic Geology (3 Credits)
The geological setting, and mineralogy of ore bodies, as well as the chemical and physical factors affecting the source, transport and deposition of metallic ores, petroleum and natural gas will be covered. The economics of mineral resources will be discussed.
Prerequisite: GEOL322; and (CHEM131 or CHEM135); and (CHEM132 or CHEM136).
Restriction: Non-degree-seeking students require the permission of the instructor.

GEOL471 Geochemical Methods of Analysis (3 Credits)
Principles and application of geochemical analysis as applied to a variety of geological problems. X-ray and optical spectroscopy, X-ray diffraction, atomic absorption, electron microprobe, and electron microscopy.
Prerequisite: CHEM131 and CHEM132; or (CHEM135 and CHEM136); or CHEM103.
Restriction: Non-degree-seeking students require the permission of the instructor.

GEOL472 Active Tectonics (3 Credits)
Provides overview of the theories, findings, and tools of Active Tectonics. The course is designed for graduate and senior undergraduate students who have basic mathematics background and have taken Structural Geology or relevant courses. Topics covered in this class include: stress and strain, crustal structure and lithosphere rheology, rock friction, geodesy, earthquake cycles, slow earthquakes, earthquake modeling, and earthquake hazards.
Prerequisite: GEOL341.
Recommended: GEOL340, GEOL447, GEOL457.
Restriction: Non-degree-seeking students require the permission of the instructor.

GEOL473 Origin and Evolution of the Continents (3 Credits)
Introduction to current theories regarding the origin and evolution of the continents. Emphasis on development of critical reading and reasoning skills, and improvement of verbal and written communication.
Prerequisite: GEOL445 and GEOL443; or permission of instructor.
Restriction: Non-degree-seeking students require the permission of the instructor.
Formerly: GEOL489I.

GEOL488 Geology Colloquium (1 Credit)
Contemporary research topics and issues in geosciences are explored through the weekly Geology departmental colloquium and discussion of its contents.
Prerequisite: At least one 300 or 400-level Geology course of at least 3 credits.
Restriction: May not be taken concurrently with GEOL497 or GEOL497H.
Repeatable to: 4 credits.

GEOL489 Special Topics (3 Credits)
Recent advances in geology.
Prerequisite: Must have completed at least 2 upper-level GEOL courses plus one additional GEOL course.
Corequisite: GEOL393.
Restriction: Must be in Geology program; and junior standing or higher.

GEOL490 Geology Field Camp (6 Credits)
Intense field geology course taught off campus during the summer. Students describe and compile maps of formations and structures from outcrops, subsurface, and remotely sensed data. Special fees required.
Prerequisite: GEOL341 and GEOL443.
Restriction: Non-degree-seeking students require the permission of the instructor.

GEOL491 Environmental Geology Field Camp (3-6 Credits)
Intensive field course designed for students of environmental geology. Students will learn to make maps, to describe soil profiles and site characteristics, to monitor hydrologic and groundwater conditions, and to measure geologic structures and stratigraphic sections.
Prerequisite: GEOL341, GEOL342, and GEOL451; or permission of CMNS-Geology department.
Restriction: Non-degree-seeking students require the permission of the instructor.
Credit Only Granted for: GEOL490 or GEOL491.

GEOL497 Recent Advances: Geology (3 Credits)
A survey of important recent advances in geological sciences in the context of the methods and practices of scientific research.
Prerequisite: Must have completed at least 2 upper-level GEOL courses.
Corequisite: GEOL393; and a third upper-level geology course.
Restriction: Must be in Geology program; and GPA of 3.0 or better in both overall and in all courses required for the major; and senior standing; and to be taken as late as possible in the program.
Credit Only Granted for: GEOL497 or GEOL489H.
Formerly: GEOL489H.

GEOL499 Special Problems in Geology (1-3 Credits)
Intensive study of a special geologic subject or technique selected after consultation with instructor. Intended to provide training or instruction not available in other courses which will aid the student's development in his or her field of major interest.
Prerequisite: (GEOL120 or GEOL100; and (GEOL102 and GEOL110)); or students who have taken courses with comparable content may contact the department. And permission of CMNS-Geology department.
Restriction: Non-degree-seeking students require the permission of the instructor.
Repeatable to: 15 credits if content differs.

GERS - German Studies

GERS103 Intensive Elementary German (4 Credits)
Covers speaking, reading, writing, listening, and culture of German-speaking world.
Prerequisite: Must have appropriate World Language Placement (WLP) score.
Restriction: Must not be a fluent/native speaker of German.
Credit Only Granted for: GERS103 or GERM103.
Formerly: GERM103.

GERS141 Yiddish I (3 Credits)
Introduction to the Yiddish language, with emphasis on speaking, reading, and writing skills. Students will also learn the history of the language, its significance to Jewish culture, its origins and basic structure.
Cross-listed with: JWST281.
Credit Only Granted for: JWST281, GERM148Y or GERS141.

GERS142 Yiddish II (3 Credits)
Introduction to the Yiddish language, with emphasis on speaking, reading, and writing skills. Students will also learn the history of the language, its significance to Jewish culture, its origins and basic structure.
Prerequisite: JWST281; or permission of ARHU-Meyerhoff Program & Center for Jewish Studies.
Cross-listed with: JWST282.
Credit Only Granted for: GERM149Z, GERS142 or JWST282.

GERS148 Germanic Languages - Elementary I (3 Credits)
Basic instruction in a Germanic language other than German; Yiddish and Swedish are offered regularly, Danish, Netherlandic, and Norwegian when demand is sufficient. Subtitle will reflect the language. May be repeated in a different language.
Repeatable to: 6 credits if content differs.
Formerly: GERM148.

GERS149 Germanic Languages - Elementary II (3 Credits)
Continuation of GERM148. May be repeated in a different language. Subtitle will reflect the language.
Prerequisite: GERM148.
Repeatable to: 6 credits.
Formerly: GERM149.

GERS150 Marx, Nietzsche, Freud in the 21st Century (3 Credits)
How does the modern world work? Karl Marx, Friedrich Nietzsche, and Sigmund Freud revolutionized how truth, history, and power are understood in the modern world. Writing against the dominant ideas of their day, all three thinkers developed strategies for uncovering what is really going on in people, societies, cultures, and political systems. Against the odds, their efforts had such an impact that some people continue to be upset by them. Come and see what all the fuss is about, hear out some of their ideas, and discuss their relevance for a wide variety of pressing contemporary issues. Where do ruling ideas come from? What generates wealth? Why are so many people so angry? Can human civilization survive, or even thrive, in the 21st century? Taught in English.

GERS169 Special Topics in Study Abroad I (1-6 Credits)
Special topics course taken as part of an approved study abroad program.
Repeatable to: 15 credits if content differs.
Formerly: GERM169.

GERS203 Intensive Intermediate German (4 Credits)
Covers speaking, reading, writing, listening, and culture of German-speaking world.
Prerequisite: GERS103; or must have appropriate World Language Placement (WLP) score.
Restriction: Must not be a fluent/native speaker of German.
Credit Only Granted for: GERM203 or GERS203.
Formerly: GERM203.

GERS204 German Grammar Review (3 Credits)
An in-depth study and analysis of selected grammatical topics in a contextualized framework.
Prerequisite: GERS203; or Must have appropriate World Language Placement (WLP) score.
Restriction: Must not be a fluent/native speaker of German.
Credit Only Granted for: GERM204 or GERS204.
Formerly: GERM204.

GERS248 Germanic Languages Intermediate - I (3 Credits)
Intermediate instruction in a Germanic language other than German. May be repeated in a different language. Subtitle will reflect the language.
Prerequisite: GERM149.
Repeatable to: 6 credits.
Formerly: GERM248.

GERS249 Germanic Languages - Intermediate II (3 Credits)
Continuation of GERM248. May be repeated in a different language. Subtitle will reflect the language.
Prerequisite: GERM248.
Repeatable to: 6 credits.
Formerly: GERM249.

GERS255 Once Upon a Time: Fairy Tales of the Brothers Grimm (3 Credits)
A critical examination of how fairy tales and folklore pervade and influence diverse facets of Western culture, ranging from issues of politics and national identity, ethics and morality, violence and fear, education and pedagogy, to gender and sexuality in the establishment and regulation of social norms. Taking the German tales collected by Jacob and Wilhelm Grimm as its focal point, the magical and often terrifying world of fairy tales within the German, European, and American cultural traditions from Romanticism to today will be explored. Taught in English.
Credit Only Granted for: GERM255 or GERS255.
Formerly: GERM255.

GERS262 A Green Giant? Environmentalism and Technology in Germany, Today and Yesterday (3 Credits)
Focuses on Germany's role as an economic and technological powerhouse and its claim to be a global environmental leader, both in the past and today. Germany is one of the leading export nations globally, with its automobiles and machinery being sold all over the world. Green technologies made in Germany leave their mark worldwide. But its businesses, scientists, and engineers have also been involved in the darkest chapters in human history: the rise of Nazism and the Holocaust. The city of Munich will be our classroom, with its global companies, memorial sites, and museums as sites of learning and discussion. With readings, visits, guided tours, and discussions, students will explore and examine German's reputation as a green nation and technological powerhouse.
Cross-listed with: HIST262.
Credit Only Granted for: GERS262 or HIST262.

GERS269 Special Topics in Study Abroad II (1-6 Credits)
Special topics course taken as part of an approved study abroad program.
Repeatable to: 15 credits if content differs.
Formerly: GERM269.

GERS289 Selected Topics in the Cultures of the German-Speaking Countries (3 Credits)
Topics in the cultures of the German-speaking countries.
Prerequisite: Permission of instructor.
Repeatable to: 6 credits if content differs.
Formerly: GERM289.

GERS299 Special Topics in German Studies (3 Credits)
Selected topics on language, literature, or culture of the German-speaking world.
Prerequisite: Permission of ARHU-School of Languages, Literatures, and Cultures department.
Repeatable to: 9 credits if content differs.

GERS301 Conversation and Composition I: The German-Speaking World (3 Credits)
Practice in contemporary spoken and written German. Systematic review of grammar, and exercises in composition. Emphasis on cultural contrasts in the German-speaking world.
Prerequisite: GERS204; or students who have taken courses with comparable content may contact the department.
Credit Only Granted for: GERM301 or GERS301.
Formerly: GERM301.

GERS302 Conversation and Composition II: Current Topics in German-Speaking Society (3 Credits)
Further practice in contemporary spoken and written German. Contemporary social, political, and cultural themes.
Prerequisite: GERS301; or students who have taken courses with comparable content may contact the department.
Credit Only Granted for: GERM302 or GERS302.
Formerly: GERM302.

GERS315 Practicum in Translation I (3 Credits)
Problems and strategies of translation from German to English.
Prerequisite: GERS301; or students who have taken courses with comparable content may contact the department.
Credit Only Granted for: GERM315 or GERS315.
Formerly: GERM315.

GERS319 Selected Topics in German Language Studies (1-3 Credits)
The analysis of the German language as a reflection of cultural, functional, and social practice in the German-speaking world.
Prerequisite: GERS203; or students who have taken courses with comparable content may contact the department.
Repeatable to: 6 credits if content differs.

GERS320 Survey of German Studies (3 Credits)
Approaches to analysis of German cultural products such as literature, film, poetry, architecture and works of art. Taught in German.
Prerequisite: GERS301; or students who have taken courses with comparable content may contact the department.
Credit Only Granted for: GERM320 or GERS320.
Formerly: GERM320.

GERS322 Highlights of German Literature and Culture (3 Credits)
Selected literary masterworks, social and cultural issues, and historical events in German-speaking countries from the Enlightenment, Romanticism, Junges Deutschland, Realism, Naturalism and its counter currents, Expressionism to the present. Taught in German.
Prerequisite: GERS302; or students who have taken courses with comparable content may contact the department.
Credit Only Granted for: GERM322 or GERS322.
Formerly: GERM322.

GERS331 Kafka and Film: The Uncanny in Literature and Film (3 Credits)
Analysis of major works by Franz Kafka (1883-1924), his affinity to the cinema and use of cinematic means and techniques (e.g. the gaze, flashback, parallel action, gesture and body language, etc.) in his writings, as well as examination of adaptations of Kafka narratives (e.g. the Orson Welles and David Jones adaptations of The Trial, 1961, 1992) and other films that use Kafkaian themes (e.g. Steven Soderbergh's 'Kafka', 1991).
Cross-listed with: CINE331.
Credit Only Granted for: GERM331, GERS331, or CINE331.

GERS339 German Literature In Translation (3 Credits)
Selected movements, genres or other special topics in German literature. Readings and instruction in English. May not be counted in the fulfillment of German major requirements in German literature.
Repeatable to: 6 credits if content differs.
Formerly: GERM339.

GERS349 Germanic Literatures in Translation (3 Credits)
Study of an important author, period or theme in a Germanic literature other than German: Yiddish, Netherlandic or Scandinavian. Taught in English.
Repeatable to: 6 credits if content differs.
Formerly: GERM349.

GERS356 German for the Professions (3 Credits)
An examination of the structures and work conditions of various industries in the German-speaking world including understanding and navigating company culture, professional development, and preparation for an internship or job where German is spoken.
Prerequisite: GERS301.
Credit Only Granted for: GERM319B, GERM356 or GERS356.
Formerly: GERM356.

GERS367 Literature in the Climate Crisis (3 Credits)
An investigation of the relationship between climate and art & literature. Introduction to ecological thinking followed by study of artistic and literary works thematically grouped by the four elements: Earth, Water, Air, and Fire. Readings from the German literary tradition (Goethe, Tieck, Stifter, Kafka, Frisch, Wolf) and contemporary research in the environmental humanities, with additional readings and viewings from elsewhere on the planet. Taught in English.
Recommended: 200-level General Education and/or humanities course; and sophomore standing.
Cross-listed with: CMLT399E.
Credit Only Granted for: GERM399E, CMLT399E, or GERS367.
Formerly: GERM399E.
Additional Information: Priority in enrollment will be given to German majors.

GERS369 Special Topics in Study Abroad III (1-6 Credits)
Special topics course taken as part of an approved study abroad program.
Repeatable to: 15 credits if content differs.
Formerly: GERS369.

GERS379 Microcourse in German Studies (1 Credit)
Exploration of diverse topics related to language, literature, and visual culture in the German-speaking world involving components of active and experiential learning. Taught in English.
Repeatable to: 6 credits if content differs.

GERS383 The 'Warrior' in German Culture: From Valiant Knights to Brazen Terrorists (3 Credits)
Acknowledging the nexus between acts of military aggression and political apparatuses, this course examines the semiotic significance of literary and cinematic manifestations of the warrior at critical junctures in German history. Taking the warrior as its focal point, this course explores the intricate web connecting various forms of military conflict, political systems of power, and social conventions within Western civilization from Antiquity to today. Taught in English.

GERS385 German Cinema (3 Credits)
A history of German cinema from the golden age of silent films to the flourishing film culture of the 21st Century. Focuses on changing ideas of the role and purpose of national cinema, as well as the cinematic representation of nation and national identity. Taught in English.
Cross-listed with: CINE385.
Credit Only Granted for: GERM385, GERS385, CINE385 or FILM385.
Formerly: FILM385.

GERS386 Experiential Learning (1-6 Credits)
Internship and practicum.
Prerequisite: Permission of ARHU-School of Languages, Literatures, and Cultures department.
Restriction: Junior standing or higher.
Credit Only Granted for: GERM386 or GERS386.
Formerly: GERM386.

GERS388 Language House Spring Colloquium (1 Credit)
For students residing in the Language House Immersion Program. Focuses on the development of skills in the target language and acquiring the cultural knowledge of the countries that speak the target language.
Restriction: Must be a resident of Language House.
Repeatable to: 8 credits.
Formerly: GERM388.

GERS389 Topics in German Culture (3 Credits)
Topics in the cultures of the German-speaking peoples. Taught in English.
Repeatable to: 6 credits if content differs.

GERS397 Honors Reading (Independent Study) (3 Credits)
Supervised reading to be taken normally only by students admitted into honors program.
Credit Only Granted for: GERM397 or GERS397.
Formerly: GERM397.

GERS398 Honors Research (3 Credits)
Prepares students to write an honors thesis. Under the direction of a German department faculty member, the student will select a thesis topic and conduct the necessary research.
Prerequisite: Permission of ARHU-School of Languages, Literatures, and Cultures department.
Repeatable to: 6 credits if content differs.
Credit Only Granted for: GERM398 or GER398.
Formerly: GERM398.

GERS399 Selected Topics in German Studies (3 Credits)
Selected topics on the language, literature, and culture of the German-speaking world.
Prerequisite: Permission of ARHU-School of Languages, Literatures, and Cultures department.
Repeatable to: 9 credits if content differs.

GERS402 Advanced Conversation and Composition (3 Credits)
Advanced instruction in and acquisition of written and oral communication skills in German
Prerequisite: GERS302; or students who have taken courses with comparable content may contact the department.
Restriction: Must not have completed GERS401 or GERS403.
Credit Only Granted for: (GERM401 and GERM403), GERM402, or GERS402.
Formerly: GERM402.

GERS411 German for International Business I (3 Credits)
Advanced skills in German for international business, including understanding and writing correspondence, reports, graphics, ads, etc., according to current German commercial style.
Credit Only Granted for: GERM411 or GERS411.
Formerly: GERM411.

GERS415 German/English Translation I (3 Credits)
An intensive presentation of German grammar limited exclusively to reading skill; graded readings in the arts and sciences. Instruction in English; cannot be used to satisfy the arts and humanities foreign language requirement.
Restriction: Must not have completed GERS103, GERS203, GERS204, GERS301, or GERS302.

GERS419 Selected Topics in German Language Studies (3 Credits)
The analysis of the German language as a reflection of cultural, functional, and social practice in the German-speaking world.
Prerequisite: GERS302; and permission of ARHU-School of Languages, Literatures, and Cultures department.
Repeatable to: 6 credits if content differs.
Credit Only Granted for: GERM419 or GERS419.
Formerly: GERM419.

GERS436 The Usual Suspects: Criminals in German Literature and Film (3 Credits)
An examination of how historical, cultural and political discourses in German-speaking countries influence social norms and criteria for judging what is considered socially acceptable or "deviant". Texts and films span from the 18th to 21st centuries. Taught in German.
Prerequisite: GERS320 or GERS322; or permission of instructor.
Credit Only Granted for: GERM436 or GERS436.
Formerly: GERM436.

GERS439 Selected Topics in German Literature (3 Credits)
Special study of an author, school, genre, or theme. Taught in German.
Prerequisite: GERS320, GERS321, or GERS322; or permission of ARHU-School of Languages, Literatures, and Cultures department.
Repeatable to: 6 credits if content differs.
Formerly: GERM439.

GERS441 Border Crossings and Cultural Transfers (3 Credits)
Border Crossings and Cultural Transfers emphasizes the transnational and global dimensions of German culture, analyzing the interrelationship of dominant and minority cultures within Germany and/or the impact of German cultures abroad. Topics include migration, exile, (post)colonialism, and globalization. Taught in German.
Prerequisite: GERS320 or GERS322.
Credit Only Granted for: GERM441 or GERS441.
Formerly: GERM441.

GERS442 Gender and Sexuality in German Literature and Society (3 Credits)
Gender and Sexuality in German Literature and Society analyzes gender and sexuality as key discourses for understanding German-speaking literatures, cultures, and societies. Topics include the history of sexuality; death and desire; and representations of gender in German literature. Taught in German.
Prerequisite: GERS320 or GERS322.
Credit Only Granted for: GERM442 or GERS442.
Formerly: GERM442.

GERS443 Literature as Cultural Discourse (3 Credits)
Investigates literature as cultural discourse in the construction of knowledge, emphasizing a discursive approach to analyzing a range of literary texts. Taught in German.
Prerequisite: GERS320 or GERS322.

GERS444 The German-Jewish Experience (3 Credits)
Focuses on the German-Jewish experience as a key dimension of European history, literature, and culture. Topics include Heinrich Heine, German-Jewish authors and texts, and the Holocaust in literature and film.
Prerequisite: GERS320 or GERS322.
Credit Only Granted for: GERM444 or GERS444.
Formerly: GERM444.
Additional Information: Taught in German.

GERS449 Selected Topics in German Studies (3 Credits)
Study of a linguistic, literary or cultural topic in Yiddish, Netherlandic, or Scandinavian studies.
Prerequisite: Permission of ARHU-School of Languages, Literatures, and Cultures department.
Repeatable to: 6 credits if content differs.
Formerly: GERM449.

GERS457 Germany: Energy Transition, Climate Change, and Sustainability (3 Credits)
Interdisciplinary examination of Germany as a leading model in dealing with contemporary issues of sustainability as well as the economic, social, and political impacts of climate change in a global world. Students will learn the basics of climate change, examine policy tools (e.g. carbon taxes, regulations, incentives, etc.) and technological innovations to curb the causes of climate change and promote sustainable practices. Students will also learn how cultural values and traditions inform policy making by examining the history of the environmental movement in German cultural artifacts (e.g., art, literature, grass-roots social movements, etc.). Designed to appeal to students with a variety of backgrounds (technical, policy and government, and humanities), the course blends site visits (e.g. coal mines, government offices, technical universities, artist studios, grass-roots collectives, museums, parks, etc.) with academic lectures by experts in pertinent fields and faculty-led discussion groups. Students will receive an overarching and holistic overview of the economic, political, and cultural costs of climate change as well as current efforts to offset the negative impacts through greater sustainability. Taught in English.
Cross-listed with: AREC357.
Credit Only Granted for: AREC357 or GERS457.

GERS458 Literary or Media Genres (3 Credits)
Literary or Media Genres studies the formal and stylistic dimensions of specific genres, emphasizing genre as a social, political, and aesthetic category. Topics include pop literature; the history of German drama; and German film genres among others.
Prerequisite: GERS320 or GERS322.
Repeatable to: 6 credits if content differs.
Formerly: GERM458.
Additional Information: Taught in German.

GERS473 Variation in Contemporary German Language (3 Credits)
Examines the unique, multilingual society that is modern Germany, exploring issues such as regional varieties, gendered language, language reform (and resistance to it), public and media speech, the influence of American English on colloquial speech and in specific fields, and the problems of immigrant communities acquiring both dialect and standard German.
Prerequisite: GERS302; or permission of instructor.
Credit Only Granted for: GERM473, GERS473, GERM673, or GERS673.
Formerly: GERM473.

GERS489 Social Issues in German Culture (3 Credits)
Special topics course examining the cultural constructions and representations of important social, political, and linguistic issues, investigating their connection to German values and institutions. Taught in German.
Prerequisite: GERS320 or GERS322.
Repeatable to: 6 credits if content differs.
Formerly: GERM489.

GERS498 Honors Thesis Writing (3 Credits)
Required for students pursuing departmental honors in German languages and literatures. Under the direction of a German department faculty member, students write their honors theses.
Restriction: Permission of ARHU-School of Languages, Literatures, and Cultures department.
Repeatable to: 6 credits if content differs.
Formerly: GERM498.

GERS499 Directed Study (1-3 Credits)
Student-driven, independent study of a specialized topic in coordination with a faculty advisor.
Restriction: Permission of ARHU-School of Languages, Literatures, and Cultures department.
Repeatable to: 6 credits if content differs.
Formerly: GERM499.

GFPL - Global and Foreign Policy

GFPL373 Sustainability (3 Credits)
Designed for students whose academic majors would be enhanced by the complementary study of a widely shared but hard-to-operationalize aspiration: that present choices should preserve or improve future options rather than foreclose or degrade them. How should we understand sustainability? How might we achieve it? How would we know if we had achieved it? And how could sustainability activists of a rising generation lead by example?
Cross-listed with: PLCY301, AGNR301.
Credit Only Granted for: AGNR301, GFPL373, or PLCY301.

GREK - Greek

GREK101 Elementary Ancient Greek I (4 Credits)
Study of basic grammar, development of reading facility, and introduction to Athenian life and culture in the fifth century B.C.
Restriction: A student who has had two units of Greek in high school may register for GREK101 for purposes of review but not for credit.

GREK102 Elementary Ancient Greek II (4 Credits)
Continuing development of basic grammar and reading skills; study and discussion of central aspects of Greek culture.
Prerequisite: GREK101; or students who have taken courses with comparable content may contact the department.

GREK111 Elementary Modern Greek I (3 Credits)
An introduction to the language and culture of modern Greece. Students begin to acquire the basic tools of the language and to communicate, in simple everyday situations. This is the first of our two-semester sequence in Elementary Modern Greek and contributes to the fulfillment of the Global Engagement requirement of the College of Arts and Humanities.
Restriction: Must not be a native speaker of Greek.

GREK112 Elementary Modern Greek II (3 Credits)
It is designed for students who have already completed the first semester course (GREK111) and/or those whose level of proficiency in Greek is not advanced enough for the intermediate level. Like GREK111, an introduction is provided to the language and culture of modern Greece. Students acquire the basic tools of the language and learn to communicate in simple, everyday situations. This is the second of our two-semester sequence in Elementary Modern Greek and contributes to the fulfillment of the Global Engagement requirement of the College of Arts and Humanities.
Prerequisite: GREK111; or permission of instructor.

GREK201 Intermediate Ancient Greek (4 Credits)
Advancing beyond the basic skills developed in GREK 101 and GREK 102; review of selected grammatical concepts; continuous reading of passages from Greek literature.
Prerequisite: GREK102; or students who have taken courses with comparable content may contact the department.

GREK211 Intermediate Modern Greek I (3 Credits)
A continuation of the study of basic structures and the development of fluency in functional, spoken and written communication. This is the first of our two-semester sequence in Intermediate Modern Greek and contributes to the fulfillment of the Global Engagement requirement of the College of Arts and Humanities.
Prerequisite: GREK112; or permission of instructor.

GREK212 Intermediate Modern Greek II (3 Credits)
A continuation in the development of fluency in spoken and written communication along with the exploration of syntactic and grammatical structures. Comprehension and vocabulary enrichment are further developed through selected readings from Modern Greek prose and poetry. This is the second of our two-semester sequence in Intermediate Modern Greek and contributes to the fulfillment of the Global Engagement requirement of the College of Arts and Humanities.
Prerequisite: GREK211; or permission of instructor.

GREK269 Special Topics in Study Abroad II (1-6 Credits)
Special topics course taken as part of an approved study abroad program.
Repeatable to: 15 credits if content differs.

GREK301 Scenes from Athenian Life (3 Credits)
Makes the transition from study of Greek grammar to reading. Focus on selected aspects of life in Athens: marriage, friendship, the courts, festival, theatre. Reading short works by three authors: Lysias, Plato, and a playwright (e.g., Menander). Readings are in ancient Greek.
Credit Only Granted for: GREK301 or GREK351.
Formerly: GREK351.

GREK369 Special Topics in Study Abroad III (1-6 Credits)
Special topics course taken as part of an approved study abroad program.
Repeatable to: 15 credits if content differs.

GREK386 Experiential Learning (3-6 Credits)
Restriction: Must have a Learning Proposal approved by the Office of Experiential Learning Programs, faculty sponsor, and student's internship sponsor; and junior standing or higher.

GREK388 Intermediate Ancient Greek Readings (3 Credits)
The reading of one or more selected Greek authors from the archaic period through late antiquity. Appropriate for those at an intermediate level in the study of ancient Greek.
Prerequisite: GREK201; or students who have taken courses with comparable content may contact the department.

GREK398 Advanced Modern Greek (3 Credits)
Develops advanced communication skills in the modern Greek language: speaking, listening, reading, and writing.
Prerequisite: GREK212; or permission of ARHU-Classics department.
Repeatable to: 6 credits.

GREK399 Topics in Advanced Modern Greek Language & Culture (3 Credits)
Development of communicative skills in advanced Modern Greek. Topics will be drawn from the social and folk life of modern Greece.
Prerequisite: GREK212; or permission of ARHU-Classics department.
Repeatable to: 6 credits.

GREK401 Intermediate Ancient Greek (4 Credits)
The third and last part of the introductory sequence to ancient Greek, the language shared by Homer, Aristophanes, Aristotle, Hippocrates, Ptolemy, Archimedes, Euclid, and Paul the Apostle, among many others whose ideas and influence have shaped our world. Students will conclude their review of the major points of grammar. strengthen their reading comprehension with select texts of Classical and New Testament (Koine) Greek, and learn about basic aspects of Athenian life and culture in the fifth century BC.
Jointly offered with: GREK201.
Restriction: Restricted to Graduate Students.
Additional Information: This course is restricted to Graduate Students; please consult with the DGS of Classics. Undergraduates who wish to study intermediate Greek should register for GREK201.

GREK411 Modern Greek Literature and History (3 Credits)
Students will study historical and political events in Greece during the 19th and 20th centuries through the viewpoint of the man of letters. Poetry, prose, plays, and essays reflect national emancipation, social reconstruction, and political struggles. Readings and discussion are in Modern Greek.
Prerequisite: Students must have earned a grade of C- or better in a 300-level Modern Greek course.
Restriction: Permission of instructor.
Credit Only Granted for: GREK311 or GREK411.
Formerly: GREK311.

GREK415 Homer (3 Credits)
Extensive readings in Greek from the Iliad or the Odyssey, with special attention to the features of Homeric style and the relationship between the two epics.
Prerequisite: Permission of ARHU-Classics department.

GREK472 History and Development of the Greek Language (3 Credits)
Mastery of ancient Greek through grammar review, prose composition, and analysis of historical developments in Greek writers' modes of expression.
Restriction: Permission of instructor.

GREK488 Greek Readings (3 Credits)
The reading of one or more selected Greek authors. Reports.
Prerequisite: Permission of ARHU-Classics department.
Repeatable to: 6 credits if content differs.
Additional Information: Readings are in ancient Greek.

GREK499 Independent Study in Greek Language and Literature (1-3 Credits)
Prerequisite: Permission of ARHU-Classics department.
Repeatable to: 6 credits if content differs.

GVPT - Government and Politics

GVPT101 Introduction to Political Science (3 Credits)
A study of the basic principles and concepts of political science.

GVPT105 Introduction to Political Ethics (3 Credits)
An examination of major theories of political life and politics as they pertain to international politics, conflict, and culture. Emphasis will be given to theories of ethics and morality that pertain to international studies, such as human rights.
Restriction: Must be in the College Park Scholars program; and must be in International Studies program or Public Leadership program.

GVPT158 Special Topics in Study Abroad I (1-6 Credits)
Special topics course taken as part of an approved study abroad program.
Repeatable to: 15 credits if content differs.

GVPT170 American Government (3 Credits)
A comprehensive study of national government in the United States.

GVPT200 International Political Relations (3 Credits)
A study of the major factors underlying international relations, the causes of conflict and cooperation among international actors, the role of international institutions, the interactions of domestic and foreign policies, and major issues in security, economy and the environment.

GVPT201 Scope and Methods for Political Science Research (3 Credits)
An introduction to empirical research in political science.
Credit Only Granted for: GVPT100 or GVPT201.
Formerly: GVPT100.

GVPT202 Law or Politics? The U.S. Supreme Court and Individual Rights (3 Credits)
A thorough examination of the state of individual rights before the U.S. Supreme Court. The course will consider how recent cases the Court has decided and current pending cases have shaped the meaning of the U.S. Constitution. A critical component will involve peer deliberation over the proper roles of law and politics and their impacts on the current state of individual rights in the United States. Students will examine constitutional case studies throughout the semester and contribute to group and classroom discussions of issues being considered by the sitting Court. Students will also learn the foundational concepts of how the Court operates as both a legal and political institution, as well as its place in the larger political system. Special emphasis will be given to the social scientific study of the Supreme Court.

GVPT203 The Challenge of Authoritarianism (3 Credits)
An introduction to the persistent challenge of authoritarianism. The course explores the nature of authoritarianism and its evolution from ancient through modern times. Students will study how authoritarian regimes vary, why citizens sometimes comply with them, and when and how citizens rebel. The course concludes with a review of contemporary authoritarianism, focusing on its resilience in the Middle East and East Asia and its potential for a resurgence in the US and Europe.

GVPT204 Uncertain Partners: US and China in a Changing World (3 Credits)
The rapid ascent of the People's Republic of China (PRC) as a major political and economic power has meant that its relationship with the United States has become central in contemporary international politics. To an increasing extent, some of the biggest global challenges--ranging from nuclear proliferation, to climate change, to economic growth--require U.S.-China cooperation if they are to be managed effectively. Yet the U.S.-China relationship is at times turbulent, and its future remains highly uncertain. Will the U.S. and China be able to forge a closer partnership that will enable them to cooperate in dealing with some of the vexing challenges facing the international community? Or are they more likely to drift toward a more adversarial relationship, as China's growing power--and the US reaction--generate a vicious cycle of mutual mistrust? In this class, students will grapple with these questions as they learn about the history of U.S.-China relations, and about many of the current issues facing the relationship.
Credit Only Granted for: GVPT204 or GVPT289J.
Formerly: GVPT289J.

GVPT205 Special Topics in International Ethics, Conflict, and Immigration (3 Credits)
An examination of issues in international ethics, conflict generated at the international level, and problems in immigration policy and law, including theories of rights and immigration, and ideological sources of international violence.
Prerequisite: GVPT105.
Recommended: GVPT241.
Restriction: Must be in College Park Scholars program; and must be in GVPT international Studies program.

GVPT206 Appetite for Change: Politics and the Globalization of Food (3 Credits)
An overview of the major forces transforming the food system--political, economic, technological, environmental--and the political debates surrounding them.
Credit Only Granted for: GVPT206 or GVPT289A.
Formerly: GVPT289A.

GVPT207 Racial and Ethnic Politics in the Obama Era (3 Credits)
This course seeks to understand the meaning and significance of Barack Obama as the first African American president. The course examines the extent to which the United States of America has entered into a post-racial society. We also examine the policy challenges Obama has faced as the first African American president. One example is the passing of comprehensive health care reform. We discuss whether opposition to health care is driven by people's racial attitudes or their different views about the role of government. Others topics that the course will examine are: how Obama became the first African American president; the strategies his campaign used to motivate citizens to the voting booth; the public's reaction to Obama's election; racial group identity during the Obama era; Trump's victory as a response to Obama.
Credit Only Granted for: GVPT207 or GVPT289O.
Formerly: GVPT289O.

GVPT208 Political Science Topics in Study Abroad (3 Credits)
The study of topics in political science taken as part of an approved study abroad program.
Repeatable to: 9 credits if content differs.

GVPT210 Religions, Beliefs, and World Affairs (3 Credits)
Introduces students to an increasingly important question: what is the relationship between religion and politics around the world? For a long period in the 20th Century, religion seemed to be decreasing in importance. Eventually, it was thought, religion would simply go away and secularism, development, and rationality would rule the day. In the last generation, however, events like the Iranian Revolution, the rise of the Christian Right, 9/11, the Tibetan monks protest, the spread of Truth and Reconciliation Commissions, and numerous wars fought in the name of God have brought religion back to prominence in world affairs. In this course, we will explore the contemporary impact of religions on politics around the world, through four broad themes: how to understand religion in politics , the relationship between religion and the state, religious groups as sources of conflict and peace, and contemporary religio-political challenges.
Credit Only Granted for: GVPT210 or GVPT289L.
Formerly: GVPT289L.

GVPT211 Peace in our time? Conflict and Conflict Resolution in International Politics (3 Credits)
Is the world getting more peaceful? Wars rage in much of the world, leading millions of people to flee as refugees or internally displaced persons. Terrorist attacks kill thousands, and can occur in any corner of the planet. At the same time many actors use strategies such as peacekeeping, mediation, and human rights promotion to resolve conflicts and build peace. In this course, we examine conflict, peace, and conflict resolution in contemporary international politics. We interrogate concepts such as peace, conflict, and violence and the different forms they take. We discuss theoretical explanations for why individuals and groups have disputes and why they choose to use violence (or not) in these disputes. We analyze conflict resolution strategies such as mediation and peacekeeping theoretically and empirically. This discussion prepares students to develop an argument for whether the world is getting more peaceful and what this could mean about the future of violence and peace.
Credit Only Granted for: HNUH228A or GVPT211.
Formerly: HNUH228A.

GVPT217 Mock Trial (3 Credits)
Experience the excitement and reward of arguing, and perhaps winning your client's case in court. Mock Trial is designed for students who are interested in learning practical techniques for shaping the evidence, using the law, and exploiting the courtroom to create a coherent and convincing case theory.
Cross-listed with: MLAW217.
Credit Only Granted for: MLAW217, GVPT217, or GVPT319A.
Formerly: GVPT319A.

GVPT221 Introduction to Formal Theories of Political Behavior and Politics (3 Credits)
An introduction to the theories of rational choice including theories of negotiation and bargaining, elections and voting in democracies, community organizing and the contrast between the roles and performances of government and market.
Prerequisite: GVPT170.

GVPT228 The Craft of Political Science Research (4 Credits)
An introduction to research design and statistics applicable to political science.
Prerequisite: GVPT100 and GVPT170.
Restriction: Must be in a major in BSOS-College of Behavioral & Social Sciences; and sophomore standing or higher.
Repeatable to: 8 credits if content differs.
Formerly: GVPT227.

GVPT241 The Study of Political Philosophy: Ancient and Modern (3 Credits)
Examines some of the salient continuities and breaks between the ancient and modern traditions in Western political philosophy.

GVPT258 Introduction to Political Science Topics in Study Abroad (3 Credits)
The study of topics in political science taken as part of an approve study abroad program.
Repeatable to: 9 credits if content differs.

GVPT273 Introduction to Environmental Politics (3 Credits)
An overview of modern environmental philosophy, politics, and policy, exploring environmental politics in the US by way of comparison with other developed and developing countries.

GVPT280 The Study of Comparative Politics (3 Credits)
An introduction to the comparative study of politics and governance, including the analytical concepts for studies of politics and a survey of the major types of regimes, including democratic and authoritarian/ communist regimes.

GVPT282 The Politics of Global Development (3 Credits)
A study of the domestic governmental institutions; processes and problems such as conflict and economic development; and the socio-economic environments that are common to lower-income countries around the world.

GVPT289 Special Topics in Government and Politics (1-6 Credits)
Substantive issues of and theoretical approaches to political phenomenon. Topics and credit vary.
Repeatable to: 6 credits if content differs.

GVPT289D How to Make Better Decisions (3 Credits)
The problem with decisions is that we rarely, if ever, find out if our decisions were good or bad. Was choosing your major, for instance, a good decision or could you have made a better one? I don't think most of us would ever know the answer to this question. So, is it possible that we regularly make bad decisions but don't know that we do? And, if so, how can we fix something if we don't know it is broken? In fact, we do regularly make bad decisions. This has been shown in many experimental studies some of which will be covered in this class. What is more, for some types of decision problems we are hardwired to make mistakes. This means that we are bound to go wrong regardless of how much we know or how smart we are. So, what can we do to remedy this problem? Quite a bit, as it turns out.

GVPT301 Identity and Conflict (3 Credits)
An examination of identity as a source of civil conflict. The course explores how identity is embedded in context, how identity is manipulated for political ends, and how identity conflict may be resolved.

GVPT306 Global Environmental Politics (3 Credits)
Focus on three processes of international environmental policy development- identifying problems, negotiating solutions, and implementing agreements- through a range of case studies, including global climate change.
Prerequisite: GVPT200.
Restriction: Must be in one of the following programs (Government & Politics; Government & Politics: International Relations) ; or permission of BSOS-Government & Politics department.

GVPT308 Political Science Topics in Study Abroad II (3 Credits)
The study of topics in political science taken as part of an approved study abroad program.
Repeatable to: 9 credits if content differs.

GVPT309 Topics in International Relations (3 Credits)
The study of topics in international relations.
Repeatable to: 6 credits if content differs.

GVPT317 Mock Trial II: Advanced Trial Advocacy (3 Credits)
Development of trial advocacy skills through participation in practice trials and intercollegiate mock trial competitions. Student may have an opportunity to represent the university in intercollegiate mock trial tournaments, including the National Mock Trial Championships.
Prerequisite: GVPT217.
Credit Only Granted for: GVPT317 or GVPT319B.
Formerly: GVPT319B.

GVPT318 Classroom to Careers (1 Credit)
Embarking on a career post-college is both an exhilarating and a challenging journey. This course is designed to demystify the transition from university to professional life for GVPT students. Throughout the course, students will engage in a structured process to identify their professional interests and navigate through potential career avenues. Additionally, weekly sessions will feature in-person meetings with GVPT alumni from diverse sectors, offering students a unique opportunity to gain insights from several real-world professional trajectories. By the course's conclusion, students will not only have a framework for career planning but also gain firsthand narratives that bridge the gap between academic study and professional endeavor.
Restriction: Must be in Government and Politics program.
Repeatable to: 2 credits if content differs.

GVPT319 Topics in Social Advocacy (1-3 Credits)
Reading, research and discussion of variety of topics related to social advocacy.
Repeatable to: 6 credits if content differs.

GVPT320 Advanced Empirical Research (3 Credits)
Allows students to build on the knowledge of statistical inference they gained from GVPT201. Topics include data collection, data cleaning, data analysis, and data visualization. By the time students complete this class, they will be able to do basic statistical modeling using OLS regression independently.
Prerequisite: GVPT201.
Restriction: Must be in Government & Politics or Government & Politics: International Relations program.

GVPT331 Courts, Law and Justice (3 Credits)
An introductory course to the study of law with emphasis on how lawyers and judges think and argue. Topics include, contract law, property, family law, torts, and criminal procedure.
Prerequisite: GVPT170.

GVPT339 Topics in Public Law (3 Credits)
The study of topics in public law.
Repeatable to: 6 credits if content differs.

GVPT349 Topics in Political Philosophy (3 Credits)
The study of topics in political philosophy.
Repeatable to: 6 credits if content differs.

GVPT354 International Development and Conflict Management (3 Credits)
Serves as the gateway course for the Minor in International Development and Conflict Management. Provides an introductory foundation in the theory and practice of international development and conflict management. Introduces the structures, key players, intersections, and main trends in the evolution of the fields. Explores causal factors that drive economic growth, poverty, inequality, and conflict, as well as the resources, methods, and tools available to track and address these issues.
Restriction: Sophomore standing or higher; and must be in one of the following minor programs (International Development and Conflict Management; Global Engineering Leadership; Global Poverty, Global Terrorism Studies) or have permission from the Center for International Development and Conflict Management program director, or must be in the Government and Politics major with permission of the Government and Politics department.
Additional Information: Students enrolled in MIDCM are expected to take the course during the Fall semester after admission to the program.

GVPT355 Capstone in International Conflict Management (3 Credits)
Serves as one of the two capstone courses for the Minor in International Development and Conflict Management. Focuses on advanced theory and the practice and profession of international conflict management and is designed to provide students an introduction to, and a chance to engage with, a core set of practical skills relevant to the field.
Prerequisite: GVPT354.
Restriction: Enrollment is restricted to students in the Minor in International Development and Conflict Management; and sophomore standing or higher; and permission of BSOS-Government & Politics department.

GVPT356 Capstone in International Development (3 Credits)
Serves as one of the two capstone courses for the Minor in International Development and Conflict Management. Focuses on advanced theory and the practice and profession of international development and is designed to provide students an introduction to, and a chance to engage with, a core set of practical skills relevant to the field.
Prerequisite: GVPT354.
Restriction: Enrollment is restricted to students in the Minor in International Development and Conflict Management; and sophomore standing or higher; and permission of BSOS-Government & Politics department.

GVPT357 IDCM Practicum Course (1 Credit)
Fulfills the practicum requirement for students who are completing the International Development and Conflict Management (IDCM) minor program. A main purpose of the course is to amplify the value of each student's practical experiences - typically an internship - by reflecting on, consolidating, and translating that background in preparation for pursuing post-graduation paths that relate to the fields of international development and conflict management. It is taken in conjunction with the student's practicum experience, either concurrently or afterward.
Prerequisite: GVPT354.
Restriction: Must be in the International Development and Conflict Management minor; and permission of the Program Director for International Development and Conflict Management.
Credit Only Granted for: BSOS388E or GVPT357.
Formerly: BSOS388E.
Additional Information: Students must have requested and received approval for their practicum experience prior to enrollment.

GVPT358 Study Abroad Seminar in Political Science (3 Credits)
The study of topics in political science.
Repeatable to: 9 credits if content differs.

GVPT359 Topics in Comparative Politics (3 Credits)
The study of topics in comparative politics.
Repeatable to: 6 credits if content differs.

GVPT360 International Negotiations (3 Credits)
A study of the complexities of international negotiation and cross-cultural decision-making. Students will apply advanced computer technology in an interactive simulation involving actual negotiations.
Prerequisite: GVPT200.

GVPT368 Special Topics in Government and Politics (3 Credits)
The study of topics in government and politics.
Repeatable to: 6 credits if content differs.

GVPT368C Asian American Politics (3 Credits)
Students will gain a greater understanding of 1) the role of Asian Americans in US politics, 2) the political attitudes and behaviors of Asian Americans and 3) how to conduct research on Asian American politics. Though the class will concentrate on Asian Americans, issues related to Asian American politics will be examined within the larger context of America's multicultural political landscape.
Cross-listed with: AAST443, AMST498J.
Credit Only Granted for: AAST498T, AAST443, GVPT368C or AMST 498J.
Formerly: AAST498T.

GVPT368P Political Psychology, Israel, and the Middle East (3 Credits)
What is the role of perceptions and misperceptions in international politics? How do emotions impact policy-making processes? Does social psychology matter when analyzing domestic politics or foreign policy? Political psychology is an interdisciplinary academic field dedicated to the analysis of the nexus between psychological and political processes. This course will identify and employ multiple pertinent political psychology theories to account for Israeli domestic politics and foreign policy as well as other major political events throughout the Middle East including nuclear proliferation, terrorism, and territorial expansionism
Cross-listed with: ISRL383.
Credit Only Granted for: ISRL329Q, ISRL383 or GVPT368P..
Formerly: ISRL329Q.

GVPT373 Geographic Information Systems for Redistricting (3 Credits)
Local, state and federal governments must periodically draw and redraw political boundaries to account for shifts in the population. This course will be an introduction and overview of district drawing and redistricting as an important application of GIS research in political science and public policy. This class will equip students to use convenient GIS tools to create and consider alternative district scenarios to find the best possible solution. After finishing this class students will be able to draw districts to define police beats, sales territories, congressional and state legislative districts, school and fire protection districts, and numerous other boundaries.Recommended: at least one course in statistics.
Prerequisite: GVPT392.
Recommended: at least one course in statistics.

GVPT376 Applied Field Research in Government and Politics (3-6 Credits)
Students in this course participate as interns in an agency of government or in some other appropriate political organization. Assignments are arranged to provide students with insights into both theoretical and practical aspects of politics. Under the tutelage of the host agency and an academic advisor, students conduct a major research project of mutual interest to the student and his or her host agency in the field of government and politics.
Prerequisite: GVPT170.
Corequisite: GVPT377.

GVPT377 Experiential Learning: Government and Politics Internship Program (3 Credits)
The application of major concepts of political science to the realities of the political process. The course connects internship experiences with larger themes of political science. Students must be admitted to the GVPT Internship Program.
Prerequisite: GVPT170.
Credit Only Granted for: GVPT377 or GVPT388W.
Formerly: GVPT388W.

GVPT379 Topics in American Politics (3 Credits)
The study of topics in American politics.
Repeatable to: 6 credits if content differs.

GVPT386 Experiential Learning (3-6 Credits)
Restriction: Permission of BSOS-Government & Politics department; and junior standing or higher.

GVPT388 Topical Investigations (1-3 Credits)
Independent research and writing on selected topics in government and politics.
Prerequisite: 1 course from GVPT200-299 course range.
Repeatable to: 6 credits if content differs.

GVPT389 Experiential Learning II (3-6 Credits)
Experiential credit for working in government & politics related internships, research, and teaching opportunities.
Restriction: Permission of BSOS-Government & Politics department; and junior standing or higher.
Repeatable to: 6 credits.

GVPT390 Game Theory (3 Credits)
Introduction to game theory with applications to political science, economics and sociology. Topics include preference theory, expected utility theory, Nash equilibria, subgame perfection, repeated games, folk theorems, and evolutionary stability.
Restriction: Must not have completed ECON414.
Credit Only Granted for: GVPT399A, GVPT390, CMSC474 or ECON414.
Formerly: GVPT399A.

GVPT392 Introduction to Geographic Information Systems for Social Science Research (3 Credits)
Introduction to the use of Geographic Information Systems for conducting research in the social sciences. Overview of spatially embedded nature of many social science phenomena and content of theories common to spatial thinking. Students will obtain hands-on experience with various GIS tools and methods most frequently employed by social scientists.
Credit Only Granted for: GVPT392, GVPT429A, or GVPT729D.
Formerly: GVPT429A, GVPT729D.

GVPT393 Intermediate Geographic Information Systems (3 Credits)
Part II of a two-semester course that integrates Geographic Information Systems with social science research. Lectures and readings will motivate the use of GIS by exposure to research applications in international relations; political and non-profit fundraising; environmental justice; public health; race relations; business and economics.
Prerequisite: Must have completed one GIS course and at least one course in statistics.
Credit Only Granted for: GVPT368I, GVPT393 or GEOG498W.
Formerly: GVPT368I.

GVPT396 Introduction to Honors Research (3 Credits)
A required course for all honors students designed to emphasize library research, methodology, and writing skills in political science and political philosophy. A written proposal, bibliography and research design for an honors paper required of all students as a final project.
Restriction: Must be in Government & Politics Honors Program; and must have permission of the Government & Politics Honors Program.

GVPT397 Honors Research (3 Credits)
Individual reading and research. Preparation of an original paper.
Prerequisite: GVPT396.
Restriction: Must be in Government & Politics Honors Program.

GVPT399 Seminar in Government and Politics (3 Credits)
Reading, research, discussion, analysis, and writing in the area of politics. Both substantive issues and methodological approaches will be considered. Primarily for government and politics undergraduate majors.
Prerequisite: 1 course from GVPT200-299 course range.

GVPT402 International Law (3 Credits)
A study of the basic character, general principles and specific rules of international law, with emphasis on recent and contemporary trends in the field and its relation to other aspects of international affairs.
Prerequisite: GVPT200.
Restriction: Must be in Government & Politics program; and junior standing or higher.

GVPT404 Political Economy of Foreign Aid (3 Credits)
The world spends hundreds of billions of dollars on foreign aid every year. The effects of this aid spending are controversial. Research supports both pessimistic and optimistic views of foreign aid's effectiveness, with little consensus. Where does aid money go? What are the motivations of aid donors? Is foreign aid effective at achieving its goals? Why or why not? This course is designed to survey the promise and the challenges of foreign aid as a policy tool. The first half of the course will focus on the motivations and goals of foreign aid. We will consider various foreign aid donors, such as countries, institutions, and individuals, to understand the motivations behind and effects of foreign aid. We will create a typology of foreign aid agendas, motivations, and donors. The second half of the course will consider the challenges specific to foreign aid. This includes both technical challenges and political challenges. We will consider the strategies that aid donors and organizations have taken to try to overcome these challenges.
Recommended: GVPT200.
Restriction: Must be in Government & Politics or Government & Politics: International Relations program.
Credit Only Granted for: GVPT409R or GVPT404.
Formerly: GVPT409R.

GVPT406 International Organizations (3 Credits)
A basic introduction to the full range of international organizations that have come into being over the past century and one-half, including those that aspire to be universal or global, those with a geopolitical or regional focus, and those that address specific structural or functional areas of human endeavor or issue areas.
Prerequisite: GVPT200.
Restriction: Must be in Government & Politics program; and junior standing or higher. Or must be in Government & Politics: International Relations program; and junior standing or higher.

GVPT407 International Political Economy (3 Credits)
Introduces the field of international political economy, which analyzes the ways in which economic and political changes produce both economic and political reactions.
Prerequisite: GVPT200.
Restriction: Must be in Government & Politics program; and junior standing or higher.

GVPT409 Seminar in International Relations and World Politics (3 Credits)
Reading, writing, and research on topics in international relations and world politics. Both substantive issues and methodological approaches will be considered.
Prerequisite: GVPT200.
Restriction: Must be in one of the following programs (Government & Politics; Government & Politics: International Relations) ; and junior standing or higher.
Repeatable to: 9 credits if content differs.

GVPT410 Politics of Nationalist and Ethnic Conflict (3 Credits)
An examination of the major causes and consequences of ethnic, nationalist, and separatist conflict. The course will focus on both theories of ethnicity and nationalism, as well as theories of conflict related to these issues. The course will also explore empirical trends in ethnic and nationalist politics.
Prerequisite: GVPT200.
Restriction: Must be in one of the following programs (Government & Politics; Government & Politics: International Relations).
Credit Only Granted for: GVPT409M or GVPT410.
Formerly: GVPT409M.

GVPT411 Conflict in the International System (3 Credits)
In this course, we will examine conflict, peace, and conflict resolution in contemporary international politics. We will interrogate what we mean by concepts such as peace, conflict, and violence, the different forms that these phenomena can take, and how we can measure their occurrence. We will discuss theoretical explanations for why individuals and groups have disputes, why these actors choose to use violence (or not) in these disputes, and ways in which violent disputes can be resolved peacefully. We will examine these arguments in a detailed study of conflicts in the Middle East, as well as by evaluating published articles that examine the effectiveness of conflict management strategies such as peacekeeping.
Prerequisite: GVPT200.
Restriction: Must be in Government & Politics or Government & Politics: International Relations program.
Credit Only Granted for: GVPT409P or GVPT411.
Formerly: GVPT409P.

GVPT413 Peace, Justice, and Conflict Resolution (3 Credits)
An examination of classic and contemporary perspectives on peace, justice, and conflict resolution after armed conflict. The goal of this course is to expose students to the advantages, risks, and challenges of the most prominent methods of conflict mitigation and resolution, including mediation and arbitration; peacekeeping, peacemaking, and peacebuilding; the protection of civilians, Responsibility to Protect, and humanitarian assistance; elections, democratization, and power-sharing; and transitional reconciliation and justice. We will do this by reading, discussing, and synthesizing classic and cutting-edge Political Science research on these topics.
Recommended: GVPT200.
Restriction: Must be in Government & Politics or Government & Politics: International Relations program.
Credit Only Granted for: GVPT409A or GVPT413.
Formerly: GVPT409A.

GVPT414 International Relations of East Asia (3 Credits)
An examination of international relations in East Asia, focusing mostly on Northeast Asia. The course will provide some background on the evolution of international politics in the region over the past several decades, and will examine several contemporary issues--including the North Korean nuclear issue, the relationship across the Taiwan Strait, and maritime disputes in the East and South China Seas--in depth.
Prerequisite: GVPT200.
Restriction: Must be in Government & Politics or Government & Politics: International Relations program.
Credit Only Granted for: GVPT409E or GVPT414.
Formerly: GVPT409E.

GVPT417 Seminar in Advanced Topics in Environmental Policy Analysis (3 Credits)
A series of critical tools and methods used to analyze environmental policy. This class should be of interest to students who are either considering a career or graduate studies in environmental protection.
Prerequisite: GVPT273.
Restriction: Must be in one of the following programs (Government & Politics; Environmental Sci&Policy-Env Politics & Policy).
Credit Only Granted for: GVPT419B or GVPT417.
Formerly: GVPT419B.

GVPT419 Seminar in Public Policy (3 Credits)
Reading, writing, and research on topics in public policy. Both substantive issues and methodological approaches will be considered.
Prerequisite: GVPT241 and GVPT170.
Recommended: GVPT270.
Restriction: Must be in Government & Politics program.
Repeatable to: 6 credits if content differs.

GVPT420 The Logic and Practice of Measuring Political Behavior (3 Credits)
Introduction to concepts and practices used for measuring political behavior. Political analysis is an increasingly quantitative field. It is crucial for students of political behavior to learn how to define concepts in concrete ways, examine different methods of measuring concepts, learn how to test the quality of chosen measures, learn how to construct richer measures out of multiple questions, and finally how to examine the relationship between multiple measures of similar concepts. Common pitfalls, errors, bias, and ethics will be examined along the way.
Prerequisite: GVPT201.
Restriction: Must be in Government & Politics program; or must be in Government & Politics: International Relations program.

GVPT421 Advanced Quantitative Methods (3 Credits)
Advanced quantitative methods for political science research.
Prerequisite: GVPT201.
Restriction: Must be in one of the following programs (Government & Politics; Government & Politics: International Relations).

GVPT422 Quantitative Political Analysis (3 Credits)
Introduction to quantitative methods of data analysis, including selected statistical methods, block analysis, content analysis, and scale construction.
Prerequisite: GVPT241 and GVPT170.
Recommended: GVPT220.
Restriction: Must be in Government & Politics program.

GVPT423 Elections and Electoral Behavior (3 Credits)
An examination of various topics relating to elections; the focus includes the legal structure under which elections are conducted, the selection and nomination process, the conduct of election campaigns, and patterns of political participation and voting choice in different types of elections.
Prerequisite: GVPT241 and GVPT170.
Restriction: Must be in Government & Politics program.

GVPT424 Quantitative Study of International Relations (3 Credits)
A comprehensive introduction to the quantitative study of international conflict. Students will perform statistical analysis of international conflict data using the R software platform.
Prerequisite: GVPT201.
Restriction: Must be in one of the following programs (Government & Politics; Government & Politics: International Relations).
Credit Only Granted for: GVPT409H (Fall 2015 and Fall 2016) or GVPT424.
Formerly: GVPT409H (Fall 2015 and Fall 2016).

GVPT428 Topics in Formal Theories of Political Behavior and Politics (3 Credits)
An evaluation of theories of political behavior such as game, social choice and voting theory, and their applications to problems of distribution and social justice, community organizing, responsive public policy, institutional design, and alliance and coalition formation.
Prerequisite: GVPT241 and GVPT221.
Restriction: Must be in Government & Politics program.
Repeatable to: 6 credits if content differs.

GVPT429 Problems in Political Behavior (3 Credits)
The problem approach to political behavior with emphasis on theoretical and empirical studies on selected aspects of the political process.
Prerequisite: GVPT241.
Recommended: GVPT220.
Restriction: Must be in Government & Politics program.

GVPT431 Introduction to Constitutional Law (3 Credits)
A systematic inquiry into the general principles of the American constitutional system, with special reference to the role of the judiciary in the interpretation and enforcement of the federal constitution.
Prerequisite: GVPT170 and GVPT331.
Restriction: Must be in one of the following programs (Government & Politics; Government & Politics: International Relations) ; and junior standing or higher.

GVPT432 Civil Rights and the Constitution (3 Credits)
A study of civil rights in the American constitutional context, emphasizing freedom of religion, freedom of expression, minority discrimination, and the rights of defendants.
Prerequisite: GVPT170 and GVPT331.
Restriction: Must be in one of the following programs (Government & Politics; Government & Politics: International Relations).

GVPT439 Seminar in Public Law (3 Credits)
Reading, writing, and research on topics in public law. Both substantive issues and methodological approaches will be considered.
Prerequisite: GVPT241 and GVPT170.
Recommended: GVPT331.
Restriction: Must be in Government & Politics program; and junior standing or higher.
Repeatable to: 6 credits if content differs.

GVPT442 History of Political Theory--Medieval to Recent (3 Credits)
A survey of the principal theories set forth in the works of writers from Machiavelli to Nietzsche.
Prerequisite: GVPT241.
Restriction: Must be in Government & Politics program.

GVPT443 Contemporary Political Theory (3 Credits)
A survey of the principal political theories and ideologies set forth in the works of writers from Karl Marx to the present.
Prerequisite: GVPT241.
Restriction: Must be in Government & Politics program.

GVPT445 Marxism and Postmarxism (3 Credits)
The study of Marxist thought and an assessment of the critical transformations and reassessments of the theory and practice of Marxism.
Restriction: Must be in a major within BSOS-Government & Politics department.

GVPT448 Non-Western Political Thought (3 Credits)
Examination of works by major authors and general themes of political thought originating in Asia, the Middle East, and Africa. This is not a survey of all non-Western political thought, but a course to be limited by the professor with each offering.
Prerequisite: GVPT241.
Restriction: Must be in Government & Politics program.
Additional Information: Permission of department required for repeat.

GVPT449 Seminar in Political Philosophy (3 Credits)
Reading, writing, and research on topics in political philosophy. Both substantive issues and methodological approaches will be considered.
Prerequisite: GVPT241.
Restriction: Must be in Government & Politics program.
Repeatable to: 6 credits if content differs.

GVPT454 Seminar in the International Relations of China (3 Credits)
Explores the foreign relations behavior of the People's Republic of China, with focus on the contemporary era.
Prerequisite: GVPT200.
Restriction: Must be in Government & Politics program; and junior standing or higher. Or must be in Government & Politics: International Relations program; and junior standing or higher.

GVPT456 The Politics of Terrorism (3 Credits)
Examination of the definition, causes and organization of terrorist activity, along with key domestic and international counter- and anti-terrorism responses. Special emphasis on challanges and opportunities to the scientific study of terrorism.
Prerequisite: GVPT200.
Restriction: Must be in Government & Politics program; or must be in Government & Politics: International Relations program.
Credit Only Granted for: GVPT456 or GVPT459T.
Formerly: GVPT459T.

GVPT457 American Foreign Relations (3 Credits)
The principles and machinery of the conduct of American foreign relations and an analysis of the major foreign policies of the United States.
Prerequisite: GVPT200.
Restriction: Must be in Government & Politics program; and junior standing or higher.

GVPT458 Special Topics in Study Abroad IV (1-6 Credits)
Special topics course taken as part of an approved study abroad program.
Repeatable to: 15 credits if content differs.

GVPT459 Seminar in Comparative Politics (3 Credits)
Reading, writing, and research on topics in comparative politics. Both substantive issues and methodological approaches will be considered.
Prerequisite: GVPT200; and (GVPT282 or GVPT280).
Restriction: Must be in Government & Politics program; or must be in Government & Politics: International Relations program.
Repeatable to: 6 credits if content differs.

GVPT460 State Politics and Government (3 Credits)
A study of the structure, procedures and policies of state governments with special emphasis on intergovernmental relationships, and with illustrations from Maryland governmental arrangements.
Prerequisite: GVPT241 and GVPT170.
Recommended: GVPT260.
Restriction: Must be in Government & Politics program; or must be in Government & Politics: International Relations program.

GVPT461 Local Politics and Government (3 Credits)
An introduction to local government and politics in the U.S. context. The course explores the evolution of local jurisdictions, particularly cities, and the politics of local level decision making.
Prerequisite: GVPT170.
Restriction: Must be in Government & Politics program; or must be in Government & Politics: International Relations program.
Credit Only Granted for: GVPT461 or GVPT479L.
Formerly: GVPT479L.

GVPT473 The U.S. Congress (3 Credits)
A detailed survey of lawmaking and the legislative process, emphasizing the U.S. Congress, and its members.
Prerequisite: GVPT241 and GVPT170.
Restriction: Junior standing or higher. And must be in Government & Politics program; or must be in Government & Politics: International Relations program.

GVPT474 Political Parties (3 Credits)
A descriptive and analytical examination of American political parties, nominations, elections, and political leadership.
Prerequisite: GVPT241 and GVPT170.
Restriction: Must be in Government & Politics program.

GVPT475 The Presidency and the Executive Branch (3 Credits)
An examination of the U.S. presidency in historical and contemporary perspective: nomination and electoral politics and the president's place in policy-making, administration, and public opinion.
Prerequisite: GVPT241 and GVPT170.
Restriction: Must be in Government & Politics program; and junior standing or higher.

GVPT476 The Business Government Relationship (3 Credits)
Examines the structures, process, and outcomes of business and government and the politics and products of their cooperative-adversarial relationships in the United States. The design integrates interest group and administrative politics and the public policy process.
Prerequisite: GVPT241 and GVPT170.
Recommended: GVPT270.
Restriction: Must be in Government & Politics program.

GVPT477 Voting and Participation (3 Credits)
A study of the factors that influence individual vote choice and voter participation in the U.S. The course will introduce political science research pertaining to both topics and will engage current controversies over such things as political campaign laws and the various state and federal rules that govern election administration.
Prerequisite: GVPT170 and GVPT241.
Restriction: Must be in Government & Politics program.

GVPT479 Seminar in American Politics (3 Credits)
Reading, writing, and research on topics in American politics. Both substantive issues and methodological approaches will be considered.
Prerequisite: GVPT241 and GVPT170.
Restriction: Must be in Government & Politics program; and junior standing or higher.
Repeatable to: 6 credits if content differs.

GVPT481 Government and Administration of Russia and the States of the Former Soviet Union (3 Credits)
A comparative study of the governmental systems and political processes of the states of the former Soviet Union.
Prerequisite: GVPT200; and (GVPT282 or GVPT280).
Restriction: Must be in Government & Politics program.

GVPT482 Government and Politics of Latin America (3 Credits)
A comparative study of the governmental systems and political processes of the Latin American countries.
Restriction: Must be in Government & Politics program; or must be in Government & Politics: International Relations program.

GVPT484 Government and Politics of Africa (3 Credits)
A comparative study of the governmental systems and political processes of the African countries, with special emphasis on the problems of nation-building in emergent countries.
Prerequisite: GVPT282 or GVPT280.
Restriction: Must be in one of the following programs (Government & Politics; Government & Politics: International Relations).

GVPT485 Government and Politics of the Middle East (3 Credits)
A comparative study of the governmental systems and political processes of Middle Eastern countries, with special emphasis on the problems of nation-building in emergent countries.
Prerequisite: GVPT200; and (GVPT282 or GVPT280).
Restriction: Must be in Government & Politics program.
Credit Only Granted for: GVPT485 or GVPT459E.
Formerly: GVPT459E.

GVPT487 Government and Politics of China (3 Credits)
Discussion of major issues in the study of the domestic politics of the People's Republic of China.
Restriction: Must be in one of the following programs (Government & Politics; Government & Politics: International Relations) ; and junior standing or higher.
Credit Only Granted for: GVPT359A or GVPT487.
Formerly: GVPT359A.

HACS - ACES-Cybersecurity

HACS100 Foundations in Cybersecurity I (2 Credits)
Interdisciplinary foundational course of the ACES program. Through lectures, lab activities, and discussions, students will learn and practice various aspects of cybersecurity. Weekly technical lectures will introduce students to the operating system UNIX. Students will partner with the Division of Information Technology in a project to engage the University of Maryland community in a cyber- hygiene and cyber-ethics campaign based on the concepts learned in class.
Restriction: Must be a first-semester student in the ACES (Advanced Cybersecurity Experience for Students) Living-Learning Program.

HACS101 Applied Cybersecurity Foundations (2 Credits)
Prepares students for team research that will be conducted in HACS 200. Students gain an understanding across the breadth of cybersecurity including system monitoring, networking basics and penetration testing. An applied approach to statistics is also included to prepare students to assess the data collected for their research projects. The course is conducted with a hands-on approach applying virtual environments to practice the concepts learned in the technical lectures each week.
Prerequisite: Minimum grade of C- in HACS100.
Restriction: Must be a second-semester student in the ACES (Advanced Cybersecurity Experience for Students) Living-Learning Program.

HACS200 Applied Cybersecurity Foundations II (2 Credits)
Students will apply the skills learned in HACS 100 and 101 to practice cybersecurity research through team led projects employing honeypots, carrying that project through all stages - proposal, implementation, and analysis. Weekly lectures will supplement project work by addressing trends observed in honeypot attacks and protections needed, along with data collection and analysis tools, and other foundational cybersecurity concepts.
Prerequisite: Minimum grade of C- in HACS101.
Restriction: Must be a third-semester student in the ACES (Advanced Cybersecurity Experience for Students) Living-Learning Program.

HACS201 Introduction to UNIX (1 Credit)
Introduction to the operating system UNIX through lectures and hands-on assignments.
Restriction: Must be a first-year student in the ACES (Advanced Cybersecurity Experience for Students) Minor Program.
Credit Only Granted for: HACS201 or CMSC216.
Additional Information: Required course for students who have not completed the ACES Living-Learning Program or taken CMSC216.

HACS202 Group Project in Cybersecurity (3 Credits)
The group project in this course will combine technical, analytical, and communication skills, further engaging students in the practice of cybersecurity. Students will learn about design concepts and data analysis as they engage in a team project designing, deploying, and collecting and analyzing data from a honeypot. The hands-on nature of the course will give students experiential insight about how and why attackers attack and how to engage in protective measures to prevent attacks.
Restriction: Must be a first-year student in the ACES (Advanced Cybersecurity Experience for Students) Minor Program; and cannot have been an ACES Living-Learning Program student (i.e., have taken HACS100, HACS101 and HACS200).

HACS208 Seminar in Cybersecurity (3 Credits)
Explores various lenses of cybersecurity in order to promote an interdisciplinary understanding of the field. Although each section may focus on a different topic, each integrates active student engagement, communication, critical communication, critical thinking, and teamwork.
Restriction: Must be a student in the ACES (Advanced Cybersecurity Experience for Students) Living-Learning Program.
Repeatable to: 6 credits if content differs.

HACS208A Accounting and Economic Aspects of Cybersecurity (3 Credits)
In today's interconnected digital world, cybersecurity has become one of the most important issues confronting organizations in both the private and public sectors of an economy. Indeed, cybersecurity is a national and economic security priority in countries throughout the world. This is an interdisciplinary Honors Seminar offered as part of UMD's ACES program. The primary objective of this course is to discuss the relationships among accounting, economics and cybersecurity, with a focus on the important roles of accounting and economics in understanding the issues related to cybersecurity. A basic framework for assessing the interactions among accounting, economics, and cybersecurity will be developed and discussed. A secondary objective of the course is to assist ACES students in developing their ability to conduct original and applied research on topics related to "accounting and economic aspects of cybersecurity."
Restriction: Must be a student in the ACES (Advanced Cybersecurity Experience for Students) Living-Learning Program.

HACS208E Introduction to Reverse Engineering (3 Credits)
An introduction to software reverse engineering tools and methodologies. Fundamental topics will be introduced: compilers, linkers, loaders, assembly language, as well as static and dynamic analysis tools. We will motivate some reasons for software reverse engineering and examine the background material necessary for an understanding of the subject. This will include computer architecture and low-level systems programming, as well as an introduction to x86_64 assembly language. We will apply this newly acquired knowledge while learning about static and dynamic analysis tools used by practitioners of software reverse engineering.
Restriction: Must be a student in the ACES (Advanced Cybersecurity Experience for Students) Living-Learning Program.

HACS208I Security Incident Handling and Management (3 Credits)
Examines the many roles, capabilities, organizations, and objectives involved in security incident handling and management. Core course content includes three major components: learning about the skill sets that people use, participating in role playing exercises that increasingly build upon this knowledge, and finally conducting exercises in a lab environment simulating security incident discovery, handling, and management.
Restriction: Must be a student in the ACES (Advanced Cybersecurity Experience for Students) Living-Learning Program.

HACS208M Project Management Techniques for IT Professionals (3 Credits)
This course aims to build an in-depth understanding of project management methodologies for IT professionals. The course explores the application of Project Management Institute (PMI) guidelines for managing projects and PMP certification. Topics include an overview of PMI standards and project management, various roles in managing technical projects, work breakdown structures, security considerations, risk assessment, testing, and implementation. The students will have an opportunity to learn how to apply PMI guidelines in a real world software development project.
Restriction: Must be a student in the ACES (Advanced Cybersecurity Experience for Students) Living-Learning Program.

HACS208N Digital Forensics (3 Credits)
Explores the various fields of digital forensics, such as memory, hard drive, and network traffic analysis. This course covers the legalities involved with forensic investigations and the wide variety of digital forensics tools, including both open source and proprietary. This course includes the different types of forensic artifacts that can be acquired and analyzed and review the careers and certifications relevant to the field.
Restriction: Must be a student in the ACES (Advanced Cybersecurity Experience for Students) Living-Learning Program.

HACS208P Beyond Technology, the Policy Implications of Cyberspace (3 Credits)
Explores the key issues facing policy makers attempting to manage the problem of cybersecurity from its technical foundations to the domestic and international policy considerations surrounding governance, response, and critical infrastructure risk management. The course is designed for students with little to no background in information technology, and will provide the principles to understand the current debates shaping a rapidly evolving security landscape.
Restriction: Must be a student in the ACES (Advanced Cybersecurity Experience for Students) Living-Learning Program.

HACS208Z Methods for Solving (And not Solving) Puzzles (3 Credits)
Surveys modern problems from different domains in computer science and cybersecurity to train our minds to appropriately approach puzzles we encounter in the future. This course covers graph theory, including what a graph is and the kinds of objects it can model, connectivity types, and vertex/edge covers algorithms. This course covers computer networks, including the models used for network stacks and what algorithms are used to solve difficult problems present in our current networks. This course covers algorithm analysis, including greedy algorithms, big O complexity, and how to analyze the capabilities and limitations of an algorithm. This course introduces cryptography, including the difference between public-key and symmetric-key cryptography, how RSA works, and the cryptanalysis of well-known cryptosystems.
Restriction: Must be a student in the ACES (Advanced Cybersecurity Experience for Students) Living-Learning Program.

HACS279 Undergraduate Research in Cybersecurity (1-3 Credits)
The Advanced Cybersecurity Experience for Students (ACES) program encourages its students to engage in research in order to gain greater insight into a specific area within cybersecurity, obtain an appreciation for the subtleties and difficulties associated with the production of knowledge and fundamental new applications, and to prepare for graduate school and the workforce.
Restriction: Must be a student in the ACES (Advanced Cybersecurity Experience for Students) Living-Learning Program; and permission of UGST-HCOL-ACES Cybersecurity Program.
Repeatable to: 6 credits if content differs.

HACS287 Undergraduate Research in Cybersecurity (3 Credits)
The Advanced Cybersecurity Experience for Students (ACES) program encourages its students to engage in research in order to gain greater insight into a specific area within cybersecurity, obtain an appreciation for the subtleties and difficulties associated with the production of knowledge and fundamental new applications, and to prepare for graduate school and the workforce.
Restriction: Must be a student in the ACES (Advanced Cybersecurity Experience for Students) Living-Learning Program; and permission of UGST-HCOL-ACES Cybersecurity Program.

HACS297 Cybersecurity Experience Reflection (3 Credits)
Cybersecurity experience is defined as an experiential learning activity either with a University of Maryland entity (such as the Division of Information Technology, the ACES competition team or in an ACES outreach program), or with an external organization that will provide valuable, hands-on experience to supplement the knowledge learned in the other ACES coursework.
Restriction: Must be a student in the ACES (Advanced Cybersecurity Experience for Students) Living-Learning Program; and permission of UGST-HCOL-ACES Cybersecurity Program.

HACS318 Cybersecurity Professionals Colloquium Series (1 Credit)
The Cybersecurity Professionals Colloquium Series explores various lenses of cybersecurity in order to promote an interdisciplinary understanding of the field. The colloquium series consists of guest lectures of cybersecurity professionals. In written assignments, students will not only summarize the lecture content but also reflect on the significance of the lecture content for the field of cybersecurity.
Restriction: Must be a student in the ACES (Advanced Cybersecurity Experience for Students) Minor Program.
Repeatable to: 2 credits.

HACS402 Applied Security Analysis and Visualization (3 Credits)
Focuses on exploratory and statistical data analysis, data and information visualization, and the presentation and communication of analysis results. These topics will be presented and explored in the context of and with applications to cybersecurity related data.
Restriction: Must be a student in the ACES (Advanced Cybersecurity Experience for Students) Minor Program.

HACS408 Advanced Seminar in Cybersecurity (3 Credits)
Explores various lenses of cybersecurity in order to promote an interdisciplinary understanding of the field. Although each section may focus on a different topic, each integrates active student engagement, communication, critical communication, critical thinking, and teamwork.
Restriction: Must be a student in the ACES (Advanced Cybersecurity Experience for Students) Minor Program.
Repeatable to: 9 credits if content differs.

HACS408C Interpersonal Cyber Communications (3 Credits)
Designed to prepare students to participate in culturally responsible and environmentally appropriate communication in the workforce. Students will explore the industry standards for writing technical reports, as well as the variances between persuasive, team, written, and oral communication styles.
Restriction: Must be a student in the ACES (Advanced Cybersecurity Experience for Students) Minor Program.

HACS408L Analytical and Forensic Techniques for Cybersecurity (3 Credits)
Explores forensic artifacts contained in digital devices, security mechanisms available to protect digital devices and mechanisms available to cybersecurity professionals for analysis of digital devices. Topics include file structure and recovery of IoT and cell phone forensic data, network data capture and analysis, enterprise mobile device management analysis and forensic investigation of digital devices (IoT, telematics systems, etc.) that interact with cell phone and other devices. Incident response, timeline analysis, and detection and analysis of artifacts will be explored in a hands-on and lab-centric course using a variety of open-source tools and commercial cloud services.
Restriction: Must be a student in the ACES (Advanced Cybersecurity Experience for Students) Minor Program.

HACS408M Introduction to Cyber Threats and Risk Management (3 Credits)
Provides an exploration of cyber risk management and present-day cyber threats, their impacts, and their mitigations. Students will take a multi-disciplinary approach to understanding threats and risks including the technical, policy, and social aspects. This course is guided by real-world cyber threats and examples.
Restriction: Must be a student in the ACES (Advanced Cybersecurity Experience for Students) Minor Program.

HACS408O Internet of Things Security (3 Credits)
This increasingly interconnected world brings a need for understanding cybersecurity challenges associated with embedded devices and systems. This course will expose students to topics in Internet of Things (IoT) and Cyber Physical System (CPS) device types, IoT/CPS threat categories, security services, distributed networking, activity privacy, and intrusion detection for embedded environments. In addition to individual homework assignments, students will participate in a semester long group project involving research, design, and implementation.
Restriction: Must be a student in the ACES (Advanced Cybersecurity Experience for Students) Minor Program.

HACS408T Penetration Testing (3 Credits)
A hands-on, technically rigorous experience that prepares students for real-world work in penetration testing and offensive security. This course will allow students to gain proficiency and become comfortable using the tools, techniques, and methodologies that represent the state of the art in penetration testing today. Students should be comfortable on the command line, and a technical exposure to networking and basic proficiency in some scripting language (Bash, Ruby, or Python) is expected.
Restriction: Must be a student in the ACES (Advanced Cybersecurity Experience for Students) Minor Program.

HACS408V Data Analysis and Visualization for Cybersecurity (3 Credits)
Focuses on exploratory and statistical data analysis, data and information visualization, and the presentation and communication of analysis results. These topics will be presented and explored in the context of and with applications to cyber security related data. Examples and illustrations will often involve the R programming language, but prior experience with R is not required and submitted work may involve the use of other languages and tools at times.
Restriction: Must be a student in the ACES (Advanced Cybersecurity Experience for Students) Minor Program.

HACS479 Undergraduate Research in Cybersecurity (1-3 Credits)
The Advanced Cybersecurity Experience for Students (ACES) program encourages its students to engage in research in order to gain greater insight into a specific area within cybersecurity, obtain an appreciation for the subtleties and difficulties associated with the production of knowledge and fundamental new applications, and to prepare for graduate school and the workforce.
Restriction: Must be a student in the ACES (Advanced Cybersecurity Experience for Students) Minor Program; and permission of UGST-HCOL-ACES Cybersecurity Program.
Repeatable to: 6 credits if content differs.

HACS487 Undergraduate Research in Cybersecurity (3 Credits)
A semester-long, individualized academic research project. Students work with a faculty supervisor to design and research an original topic. Students engage in research to gain greater insight into a specific area within cybersecurity, obtain an appreciation for the subtleties and difficulties associated with the production of knowledge and fundamental new applications, and prepare for graduate school and/or the workforce.
Restriction: Must be a student in the ACES (Advanced Cybersecurity Experience for Students) Minor Program; and permission of UGST-HCOL-ACES Cybersecurity Program.

HACS497 Cybersecurity Experience Reflection (3 Credits)
Cybersecurity experience is defined as an experiential learning activity either with a University of Maryland entity or with an external organization that will provide valuable, hands-on experience to supplement the knowledge learned in other ACES coursework. This course is intended to help students reflect on their cybersecurity experience and to learn from others' cybersecurity experiences. It is also intended to help students gain professional skills that will aid in their future career.
Prerequisite: Students may enroll concurrently with or after completing a cybersecurity related internship experience of at least 135 hours.
Restriction: Must be a student in the ACES (Advanced Cybersecurity Experience for Students) Minor Program; and must not have taken HACS297.
Credit Only Granted for: HACS297 or HACS497.

HACS498 Cybersecurity Group Problem Solving (3 Credits)
The Advanced Cybersecurity Experience for Students (ACES) program encourages its students to engage in team problem solving activities in order to gain greater insight into a specific area within cybersecurity and to obtain an appreciation for the subtleties and difficulties associated with these activities in order to prepare students for graduate school and the workforce. Students engage in a semester long problem solving or development project under the mentorship of a industry specialist and with the guidance of university faculty. Through the exercise the students will develop teamwork experience and professional communication skills in addition to experience of the project itself. The project might be evaluation, creation, testing or analysis of some area of cybersecurity as needed by the mentor-sponsor. A contract of what will be accomplished is required must be agreed upon by the mentor, the student and the ACES leadership before the project can begin.
Restriction: Must be a student in the ACES (Advanced Cybersecurity Experience for Students) Minor Program; and permission of UGST-HCOL-ACES Cybersecurity Program.
Repeatable to: 6 credits.

HBUS - Interdisciplinary Business Honors

HBUS100 The Future of Work: Interdisciplinary Foundations and Horizons of Business (3 Credits)
What should the future of work look like? Traditional hierarchies have come under increased scrutiny today for many reasons especially because it may not promote diversity, equity, and inclusion in the workplace. Moreover, they may not encourage experimentation, innovation, and business success. Not surprisingly then, companies are redefining what the future of work should look like. What are the shared responsibilities of an employer and employee? How can technology improve productivity and promote equity? What culture should businesses promote to welcome all employees and ensuring accountability? This course will address these and related questions.
Restriction: Must be a student in the Interdisciplinary Business Honors Program.

HBUS105 The Future of Analysis: Making Data Driven Decisions in Business (3 Credits)
Students will address questions regarding how business is being shaped by the increased use of data. The course draws from various quantitative, computation, and technical fields to develop a big picture understanding of data science in business. Through examples and applications, students will address the challenging questions related to artificial intelligence, data science bias, and privacy.
Prerequisite: HBUS100.
Restriction: Must be a student in the Interdisciplinary Business Honors Program.

HBUS200 Business and Deliberation: Innovation and Equity in Conditions of Uncertainty and Diversity (3 Credits)
How can managers better promote a diversity of thought within their organization? When business leaders tap into the plurality of perspectives among their employees, they can improve on many dimensions. Unfortunately, many businesses fail to create a culture of inclusion that puts them at a disadvantage when managing uncertainty. How can managers better listen to internal and external stakeholders? How can these diverse perspectives better inform business decision making? How can businesses with multiple objectives - such as triple bottom line companies - better engage with their employees, customers, and corporate partners? This course will address these and related questions.
Prerequisite: HBUS100 and HBUS105.
Restriction: Must be a student in the Interdisciplinary Business Honors Program.

HBUS205 Capstone in Interdisciplinary Business (3 Credits)
As the capstone course in the Interdisciplinary Business Honors (IBH) Program, this course will give students the opportunity to apply what they have learned in the IBH program to a real-world company. This company will help present students with an opportunity to address a pressing challenge
Prerequisite: HBUS100, HBUS105, and HBUS200.
Restriction: Must be a student in the Interdisciplinary Business Honors Program.

HBUS307 Business Experience Reflection (3 Credits)
This course includes reflection on a completed business experience and preparation for future professional experiences. A business experience is defined as an experiential learning activity either with an external organization, i.e. an internship, or with a University of Maryland organization, that will provide valuable, hands-on experiences to supplement the knowledge learned in the IBH curriculum.
Restriction: Must be a student in the Interdisciplinary Business Honors Program; and permission of the IBH Program.

HDCC - Design Cultures and Creativity

HDCC105 Introduction to Design Cultures and Creativity I (3 Credits)
History, concepts, and technologies of creative design expression, coupled with an introduction to development for particular platforms and devices.
Restriction: Must be in the Design Cultures and Creativity Honors College Living/Learning program.

HDCC106 Seminar in Design Cultures & Creativity (3 Credits)
Introduction to the methods and theory of design production, with emphasis on creative and expressive platforms.
Restriction: Must be in the Design Cultures and Creativity Honors College Living/Learning program.

HDCC201 Capstone Proposal Through Design Thinking (1 Credit)
Engages principles of design thinking to prepare second-year students in the Design Cultures and Creativity (DCC) program to create a proposal for their spring Capstone Project.
Prerequisite: HDCC105 and HDCC106.
Restriction: Must be in the Design Cultures and Creativity Honors College Living/Learning program.

HDCC208 Seminar in Digital Cultures and Creativity (3 Credits)
An advanced seminar in specific aspects of digital culture and creativity, designed to keep students abreast of the latest developments in new media and the online world. Possible topics include mobile gaming, digital storytelling, and electronic music.
Prerequisite: HDCC106 and HDCC105.
Restriction: Must be in the Digital Cultures and Creativity Honors College Living/Learning program.
Repeatable to: 6 credits if content differs.

HDCC209 Capstone in Design Cultures and Creativity (3 Credits)
Capstone for Design Cultures and Creativity in which students will develop their program capstone projects under the supervision of a faculty mentor, with regular checkpoints and presentations to track progress.
Prerequisite: HDCC208.
Restriction: Must be in the Design Cultures and Creativity Honors College Living/Learning program.
Repeatable to: 6 credits if content differs.

HDCC379 Design Cultures and Creativity Independent Study (1-3 Credits)
Involves research and/or creative scholarship directed by individual DCC faculty outside of the formal classroom structure.
Prerequisite: HDCC105.
Restriction: Must be enrolled in the Design Cultures and Creativity Honors College living-learning program; and permission of UGST-HCOL-Design Cultures & Creativity Program.
Repeatable to: 6 credits if content differs.

HEBR - Hebrew

HEBR102 Elementary Hebrew I-B (3 Credits)
Modern Israeli Hebrew. Emphasis on conversation. Study of linguistic structure and development of audio-lingual, writing and reading ability. Corresponds to the second half of HEBR111.
Restriction: Must not have completed HEBR111.
Credit Only Granted for: HEBR102 or HEBR111.

HEBR103 Elementary Hebrew II-A (3 Credits)
Continuation of HEBR102 and HEBR111. Modern Israeli Hebrew. Emphasis on conversation. Study of linguistic structure and development of audio-lingual, writing, and reading ability. Corresponds to the first half of HEBR112.
Prerequisite: HEBR111 or HEBR102; or must have placement by the Hebrew coordinator.
Restriction: Must not have completed HEBR112.
Credit Only Granted for: (HEBR103 and HEBR104) or HEBR112.

HEBR104 Elementary Hebrew II-B (3 Credits)
Continuation of HEBR103. Modern Israeli Hebrew. Emphasis on conversation. Study of linguistic structure and development of audio-lingual, writing, and reading ability. Corresponds to the second half of HEBR112.
Prerequisite: HEBR103; or must have placement by the Hebrew coordinator.
Restriction: Must not have completed HEBR112.
Credit Only Granted for: (HEBR103 and HEBR104) or HEBR112.

HEBR106 Intensive Elementary Hebrew I (4 Credits)
An intensive study of fundamentals of Hebrew reading, writing, listening and Israeli culture. Covers present tense in all verb categories, basic syntax and builds vocabulary.
Prerequisite: Must have appropriate World Language Placement (WLP) score.
Credit Only Granted for: HEBR111 or HEBR106.

HEBR107 Intensive Elementary Hebrew II (4 Credits)
A continuation of intensive study of fundamentals of Hebrew reading, writing, listening, speaking and Israeli culture. Covers past tense in all verb categories, basic syntax and builds vocabulary.
Prerequisite: HEBR106 or HEBR111; or must have appropriate score on World Language Placement (WLP); or students who have taken courses with comparable content may contact the department.
Credit Only Granted for: HEBR107 or HEBR112.

HEBR199 Special Topics in Hebrew (3 Credits)
Topics in language, literature, and culture. Varies by semester and instructor.
Prerequisite: Permission of ARHU-School of Languages, Literatures, and Cultures department.
Repeatable to: 9 credits if content differs.

HEBR203 Intermediate Hebrew II-A (3 Credits)
Continuation of HEBR211 Study of linguistic structure, further development of audio-lingual, reading, writing, and speaking skills. Reading of texts and newspapers designed to give some knowledge of Hebrew life, thought and culture. Corresponds to the first half of HEBR212.
Prerequisite: HEBR212; or must have placement by the Hebrew coordinator.
Restriction: Must not have completed HEBR212.
Credit Only Granted for: (HEBR203 and HEBR204) or HEBR212.

HEBR204 Intermediate Hebrew II-B (3 Credits)
Continuation of HEBR203. Study of linguistic structure, further development of audio-lingual, reading, writing, and speaking skills. Reading of texts and newspapers designed to give some knowledge of Hebrew life, thought and culture. Corresponds to the second half of HEBR212.
Prerequisite: HEBR203; or must have placement by the Hebrew coordinator.
Restriction: Must not have completed HEBR212.
Credit Only Granted for: (HEBR203 and HEBR204) or HEBR212.

HEBR206 Intermediate Intensive Hebrew I (4 Credits)
Provides a comprehensive review of the fundamentals of Hebrew grammar and oral skills, and introduces new skills in future tense verb conjugation, and communication in reading, writing, listening and speaking.
Prerequisite: Must have completed HEBR107 OR HEBR112; or must have appropriate World Language Placement (WLP) score.
Restriction: Must not be a fluent/native speaker of Hebrew.
Credit Only Granted for: HEBR206 or HEBR211.

HEBR207 Intensive Intermediate Hebrew II (4 Credits)
A review of the fundamentals of Hebrew grammar, reading, writing, listening and speaking.
Prerequisite: Must have completed HEBR206 OR HEBR211; or have the appropriate Score on the World Language Placement (WLP); or students who have taken courses with comparable content may contact the department.
Credit Only Granted for: HEBR207 or HEBR212.

HEBR212 Intermediate Hebrew II (6 Credits)
Continuation of HEBR211.
Prerequisite: HEBR211; or permission of ARHU-School of Languages, Literatures, and Cultures department.
Restriction: Must not have completed HEBR203; and must not have completed HEBR204.
Credit Only Granted for: (HEBR203 and HEBR204) or HEBR212.

HEBR249 Special Topics in Hebrew Studies (1-3 Credits)
A broad range of cultural and societal topics pertaining to the communication of Hebrew.
Prerequisite: Must have completed HEBR206; or HEBR211; or must have appropriate score on Foreign Language Placement Assessment; or students who have taken courses with comparable content may contact the department.
Repeatable to: 9 credits if content differs.

HEBR269 Special Topics in Study Abroad II (1-6 Credits)
Special topics course taken as part of an approved study abroad program.
Repeatable to: 15 credits if content differs.

HEBR298 Special Topics in Jewish Studies (3 Credits)
Repeatable to: 6 credits if content differs.

HEBR298B Introduction to the Hebrew Bible/Old Testament (3 Credits)
Origins of the Hebrew Bible (Old Testament), with attention to literary formations, archaeology, and social-political settings. Explorations of major questions, including who wrote the Bible, and when; relationships of the biblical tradition to the mythology and religious structures of ancient Israel's near eastern neighbors; and dynamics of politics, religious leadership, and law.
Cross-listed with: JWST262, ENGL262.
Credit Only Granted for: JWST262, HEBR298B, or ENGL262.

HEBR298O Jewish Languages in America (3 Credits)
With a particular focus on language minority intra-group relationships -- the convergences, divergences, feelings of solidarity and tensions of difference within the group--this course will examine the history, current functional use and identity implications of Jewish languages in the United States.
Cross-listed with: JWST285.
Credit Only Granted for: JWST285, JWST219O or HEBR298O.
Formerly: JWST219O.

HEBR313 Conversation and Composition I (3 Credits)
A practical language course recommended for all students continuing with Hebrew. Review of grammar and composition. Selected readings. Oral and written exercises.
Prerequisite: HEBR212; or students who have taken courses with comparable content may contact the department.

HEBR314 Conversation and Composition II (3 Credits)
A practical language course recommended for all students continuing with Hebrew. Review of grammar and composition. Selected readings. Oral and written exercises.
Prerequisite: HEBR313; or students who have taken courses with comparable content may contact the department.

HEBR369 Special Topics in Study Abroad III (1-6 Credits)
Special topics course taken as part of an approved study abroad program.
Repeatable to: 15 credits if content differs.

HEBR381 Introduction to Hebrew Cultural Studies (3 Credits)
Critical study of Israeli culture with emphasis on literature, film, and art as sites of struggle over political and social meaning during times of cultural transformation. Focus on the historical development of Israeli identity and gender, in particular within the military and Zionist youth movements. Taught in Hebrew.
Prerequisite: HEBR314; or permission of instructor.

HEBR386 Experiential Learning (3-6 Credits)
Restriction: Must have a Learning Proposal approved by the Office of Experiential Learning Programs, faculty sponsor, and student's internship sponsor; and junior standing or higher.

HEBR388 Language House Colloquium (1 Credit)
For students residing in the Language House Immersion Program. Focuses on the development of skills in the target language and acquiring the cultural knowledge of the countries that speak the target language.
Restriction: Must be a resident in the Language House Immersion program.
Repeatable to: 8 credits.

HEBR430 Critical Issues in Israeli Cinema (3 Credits)
Critical investigation of Zionist and Israeli culture and politics through film.
Cross-listed with: CINE430.
Credit Only Granted for: HEBR430, CINE430 or FILM430.
Formerly: FILM430.

HEBR498 Special Topics in Hebrew (3 Credits)
Repeatable to: 6 credits if content differs.

HEBR499 Independent Study in Hebrew (1-3 Credits)
Independent study under faculty supervision.
Prerequisite: Permission of instructor.
Repeatable to: 6 credits if content differs.

HEIP - Entrepreneurship and Innovation

HEIP143 Foundations of Entrepreneurship and Innovation (1 Credit)
Foundational ideas and terms in entrepreneurship and innovation are introduced, with attention to developing students understanding of cultivating a business in diverse, global environments; leading and collaborating in a competitive world; developing an entrepreneurial mind for an entrepreneurial world; and industry dynamics of technological innovation.
Restriction: Must be in the Entrepreneurship and Innovation Program (EIP).

HEIP144 Contemporary Issues in Entrepreneurship and Innovation (3 Credits)
Inspires entrepreneurial innovation and creativity through interactive lectures, workshops, and case studies on contemporary issues to include energy, life sciences, healthcare, and technology. Explores entrepreneurial innovation sources, structures and dynamics. Helps students develop skills for generating ideas and addressing current issues and problems.
Prerequisite: HEIP143.
Restriction: Must be in the Entrepreneurship and Innovation Program (EIP).

HEIP240 Exploring International Entrepreneurship and Innovation (3 Credits)
An introduction to the opportunities and challenges of entrepreneurship and innovation from an international perspective.
Restriction: Must be an EIP student in good-standing.

HEIP241 EIP Capstone: Creating Enterprise with Social Impact (2 Credits)
Addresses the global necessity to develop and implement solutions to critical social and environmental concerns in ways that are both technologically viable and economically sustainable. Through group exercises, guest speakers, discussions, and experiential learning activities, students will develop the skills to create businesses that achieve the double bottom line of both profitability and social benefit.
Restriction: Must be in the Entrepreneurship and Innovation Program (EIP).

HESI - Higher Ed, Student Affairs, and International Ed Policy

HESI202 Race and Diversity in Higher Education (3 Credits)
Will discuss contemporary and controversial issues on race and diversity in higher education. Addresses the question: How should race influence college admissions and campus climate? Will expose students to different viewpoints on the role of race in higher education settings.

HESI220 Adaptive Strategies for Multicultural Leadership and Dialogue (3 Credits)
As U.S. society becomes increasingly complex along multiple and continually evolving dimensions of individual and group identities, successful leaders will benefit from learning adaptive strategies and practices that will help them to navigate this complexity and adapt effectively in a climate of constant change. This class will focus on specific strategies, concepts, and insights for successful leadership and dialogue in twenty-first century U.S. multicultural society.
Restriction: Must not have completed BSCV301; and junior standing or lower.
Credit Only Granted for: EDCP318L or HESI220.
Formerly: EDCP318L.

HESI221 Leadership, Power and Privilege (3 Credits)
Critical analysis of social issues, contemplative practice, and dialogue are used to examine how power and privilege operate at individual, institutional, and societal levels to impact leadership perceptions and behaviors.

HESI298 Special Problems in Higher Education, Student Affairs, and International Education Policy (1-6 Credits)
Individual instruction in special problems related to higher education, student affairs and international education policy.
Restriction: Permission of EDUC-Counseling, Higher Education and Special Education department.

HESI310 Transfer2Terp Learning Community: Applying Your Strengths at the University of Maryland and Beyond (3 Credits)
Students will identify their strengths and learn how to apply them both in and outside of the classroom. Students will work side by side with the faculty and staff in the Adele H. Stamp Student Union to learn about their strengths while applying them to leadership positions.
Restriction: Priority will be given to students transferring from Maryland Community Colleges; or permission of EDUC-Counseling, Higher Education and Special Education department.

HESI318 Applied Contextual Leadership (3 Credits)
Course will utilize experiential learning opportunities to develop and apply the knowledge and skills of leadership into specific contexts of leadership practice.
Restriction: Permission of EDUC-Counseling, Higher Education and Special Education department.
Repeatable to: 6 credits if content differs.
Credit Only Granted for: HESI318 or EDCP318.
Formerly: EDCP318.

HESI418 Special Topics in Leadership (3 Credits)
The special topics and leadership course will address a single topic related to leadership through the semester. In-depth study and analysis on the topic will be the basis for the course. Topics include gender and leadership, ethics and leadership, and culture and leadership. Leadership will serve as the foundation in the course.
Repeatable to: 6 credits if content differs.
Credit Only Granted for: HESI418 or EDCP418.
Formerly: EDCP418.

HESI421 Leadership and the Black Community (3 Credits)
Examines leadership from the perspective of the African American experience. Specifically, we will explore the concept and differing meanings of "leader and leadership" within the African-American community in the United States. Issues of leaders and leadership will be examined as influenced by political, cultural, and historic events. The course will place particular emphasis on colleges and universities as a microcosm of the larger society and as a cultural site for exploring and assessing issues of African American leadership.
Credit Only Granted for: HESI418B or HESI421.
Formerly: HESI 418B.

HESI422 Women and Leadership (3 Credits)
The primary goal of this course is for students to develop an understanding of women's leadership and women's ways of influencing organizations. The course will rely heavily on the idea that you must know yourself first before you explore how "you" fit into the organization and how that organization fits into a broader context such as nation, culture, or community. We will talk about the social constructs of leadership and gender, including systems and structures, and the role media, television, movies, and sports play in defining women and their leadership in a cultural context. The exploration of women leaders will be broad based including the role that gender identity and expression, race, sexual orientation, country of origin, and ethnicity/culture play in women's definition and the expression of their leadership.
Credit Only Granted for: HESI418G or HESI422.
Formerly: HESI418G.

HESI423 Leadership and Ethnicity (3 Credits)
Examines the concept of leadership from the standpoint of race, ethnicity, and culture. Specifically, we will explore the concept and differing meanings of leader and leadership within racial/ethnic communities in the United States. Issues of leaders and leadership will be examined as influenced by political, cultural, and historic events. The course will place particular emphasis on colleges and universities as a microcosm of the larger society and as a cultural site for exploring and assessing issues of race, ethnicity, diversity and leadership.
Credit Only Granted for: HESI418D or HESI423.
Formerly: HESI418D.

HESI424 Leadership and the Jewish Community (3 Credits)
Offers students the opportunity to critically examine leadership and leadership identity development in relation to Jewish culture and identity. Explores how Jewish culture and ethnicity influence leadership styles and the role that leadership has played within Jewish history. Students will explore general leadership theories as well as personal leadership identity development in both an overall sense and as a member of the Jewish community. Examines leaders within the Jewish movement and how their leadership has influenced Jewish communities and explores issues facing the Jewish community both on college campuses and in the world and prepare student leaders to act as advocates for the Jewish community.
Credit Only Granted for: HESI418F or HESI424.
Formerly: HESI418F.

HESI470 Introduction to Student Personnel (3 Credits)
A systematic analysis of research and theoretical literature on a variety of major problems in the organization and administration of student personnel services in higher education. Included will be discussion of such topics as the student personnel philosophy in education, counseling services, discipline, housing, student activities, financial aid, health, remedial services, etc.
Restriction: Permission of EDUC-Counseling, Higher Education and Special Education department.
Credit Only Granted for: EDCP470 or HESI470.
Formerly: EDCP470.

HESI489 Field Experiences in Higher Education, Student Affairs, and International Education Poli (1-4 Credits)
Planned field experience in education and community related activities. Credit not to be granted for experiences accrued prior to registration.
Restriction: Permission of EDUC-Counseling, Higher Education and Special Education department.

HESI498 Special Problems in Higher Education, Student Affairs, and International Education Policy (1-3 Credits)
Available only to HESI students who have formal plans for individual study of approved problems.
Prerequisite: Available only to HISA, HIED, and HIEP students who have formal plans for individual study of approved problems.
Restriction: Permission of EDUC-Counseling, Higher Education and Special Education department.

HESI499 Workshops, Clinics, Institutes (1-6 Credits)
The following type of educational enterprise may be scheduled under this course heading: workshops conducted by the Higher Education, Student Affairs, and International Education Policy program (or developed cooperatively with other departments, colleges and universities) and not otherwise covered in the present course listings.
Repeatable to: 6 credits.

HESP - Hearing and Speech Sciences

HESP120 Introduction to Linguistics (3 Credits)
An introduction to the scientific study of natural language with focus on the basic concepts of phonology, syntax, semantics and pragmatics, with subsequent attention to the applied aspects of linguistic principles.
Additional Information: HESP120 is required for HESP majors. HESP majors may not substitute LING200.

HESP202 Introduction to Hearing and Speech Sciences (3 Credits)
An introduction to communication sciences and disorders; a survey of the bases of normal speech, language and hearing ability, major forms of communicative disorders and their treatment.

HESP204 Multicultural Issues in Communication Disorders (3 Credits)
Enables students to understand cultural influences on communication, communication disorders, language, and society. Exploration of (self and others') perceptions, stereotypes, media influences and identity will be used to understand how society shapes and responds to language usage. We will also examine the legal and ethical implications of serving culturally and linguistically diverse populations.

HESP214 The Research Behind Headlines on Words, Thought, and Behavior (3 Credits)
How does the human mind use language? Type "Language Science News" into your Google search bar. Among the more than 3 billion hits, headlines like "What is love? It depends what language you speak" and "Science's English dominance hinders diversity" invite you to think about the impact of words on thought and behavior. These are stories about how humans acquire and use language, but they ultimately address big questions about how we experience knowledge itself. In a world of unprecedented access to science journalism, did you ever read a headline about human behavior and wonder: How do we know? This class takes up the elegant ways cognitive scientists design experiments to answer crucial questions about language and thought, brain and behavior, that have no intuitive answers. Students will dive deep into the media coverage of their favorite claims about what we know, debate the psychological science behind these claims, and develop transferable critical-thinking skills in the process.
Cross-listed with: HNUH278A.
Credit Only Granted for: HNUH278A or HESP214.

HESP250 Introduction to Language Science (3 Credits)
Language science is the scientific study of how humans acquire, use, comprehend, and produce language. Most people in all societies learn and use their native language or languages with apparent ease - but don't be fooled: languages are highly complex, and speaking and understanding language requires some amazing feats of mental acrobatics. Thus there are many opportunities for difficulties with language, which is the focus of our field. Understanding difficulties with speech, language, and hearing require first understanding how processing works when language is successful - the psychological (behavioral) and neurobiological (brain) factors that enable people to learn and use language despite its intricacies, the structure and properties of language itself, and how knowledge of language is acquired, represented, and processed in the mind and brain.
Credit Only Granted for: HESP150 or HESP250.
Formerly: HESP150.

HESP258 Special Topics in Study Abroad II (1-6 Credits)
Special topics course taken as part of an approved study abroad program.
Repeatable to: 15 credits if content differs.

HESP300 Introduction to Psycholinguistics (3 Credits)
An introduction to current theories of language and an investigation of their relationship to human communication behavior. Survey of the experimental literature relating to this question.
Prerequisite: Minimum grade of C- in HESP202; or permission of BSOS-Hearing & Speech Sciences department.
Recommended: HESP120.

HESP305 Anatomy and Physiology of the Speech Mechanism (3 Credits)
Anatomy, physiology, and neurology of speech mechanism.
Prerequisite: Minimum grade of C- in HESP202; or permission of BSOS-Hearing & Speech Sciences department.

HESP306 Anatomy and Physiology of Speech & Hearing (3 Credits)
Focuses on the biological and neurological bases of human speech production and human hearing, namely the anatomy, physiology, and neurology of the vocal/speech mechanism and the hearing mechanism. Specifically, respiration, phonation, resonance, articulation, swallowing, and hearing will be highlighted. A strong understanding of normal anatomy and physiology is essential for the successful evaluation and treatment of patients with speech, language, swallowing and hearing disorders.
Credit Only Granted for: HESP306, HESP311, or HESP305.

HESP307 Speech & Hearing Science (3 Credits)
Human hearing is exquisitely sensitive, allowing us to hear extremely faint sounds, to follow the sounds of a friend's voice in a loud party, and to appreciate subtle differences between words in the language. This course provides an introduction to the basic physics of sound, the acoustic properties of the sounds of speech, and the mechanisms by which those sounds are perceived by the listener.
Credit Only Granted for: HESP307 or HESP407.

HESP311 Anatomy, Pathology and Physiology of the Auditory System (3 Credits)
Gross anatomy of the ear and pathways for transmission of sound energy through the peripheral and central auditory system. Causes, development and effects of pathological conditions contributing to temporary or chronic hearing impairments.
Prerequisite: Minimum grade of C- in HESP202; or permission of BSOS-Hearing & Speech Sciences department.

HESP313 Neuroscience for Speech and Hearing (3 Credits)
Designed to provide an understanding of normal neuroanatomy and neurophysiology of speech and language. It will also provide preliminary information regarding pathologic processes, especially those affecting speech and language
Credit Only Granted for: HESP313 or HESP422.

HESP359 Special Topics in Study Abroad III (1-6 Credits)
Special topics course taken as part of an approved study abroad program.
Repeatable to: 15 credits if content differs.

HESP386 Experiential Learning (1-3 Credits)
Students will have the opportunity observe and/or participate in therapy activities provided by a speech-language pathologist or audiologist in this experiential learning course.
Restriction: Junior standing or higher; and permission of BSOS-Hearing & Speech Sciences department.

HESP389 LEAP Classroom Internship (1-3 Credits)
Participation in a language-based, literacy-rich preschool classroom for children with speech-language disorders. Students will learn behavior management techniques, curriculum planning and implementation, facilitation of play among children, data collection and teaching srategies.
Prerequisite: HESP202; or students who have taken courses with comparable content may contact the department.
Restriction: Permission of BSOS-Hearing & Speech Sciences department.

HESP396 SIGNA Undergraduate Peer Mentor Clinical Practicum (2 Credits)
Students are paired with neurodivergent UMD students to support mentoring in social communication and executive functioning skills. Peer mentors are selected based on a rigorous application process for fall and spring semesters. Selected peer mentors will engage in an orientation process which includes in depth information on neurodiversity and the intersectionality of DEI; attend a weekly lecture and group sessions to acquire up-to-date knowledge and application of knowledge with neurodiverse populations; and manage meetings with neurodivergent students one-to-one on a weekly basis to support carryover of social coaching and executive functioning strategies.
Prerequisite: HESP202.
Recommended: Coursework in PSYC, EDUC, Human Development, Disability Studies.
Restriction: Sophomore standing or higher; and permission by instructor .

HESP397 SIGNA Undergraduate Peer Coach Clinical Practicum (3 Credits)
Students co-lead weekly groups for neurodivergent college students, coaching on topics and strategies pertaining to social communication and executive functioning skills. Peer coaches create outlines for weekly groups which are individualized by needs and interests. Peer coaches plan monthly social outings for SIGNA personnel to support generalization of executive functioning and social communication skills. Peer coaches are selected based on a rigorous application process for fall and spring semesters. Students who previously served in a peer mentor role in SIGNA are given priority consideration as peer coaches. Peer coaches will engage in an orientation process which includes in depth information on neurodiversity; attend weekly lectures to acquire up-to-date knowledge of neurodiverse populations; and attend group debrief meetings with the course instructor on a weekly basis to support implementation of social coaching and executive functioning feedback from groups.
Prerequisite: HESP202.
Recommended: Coursework in PSYC, EDUC, Human Development, Disability Studies, HESP396.
Restriction: Junior standing or higher; and permission of instructor.

HESP400 Speech and Language Development in Children (3 Credits)
Analysis of the normal processes of speech and language development in children.
Prerequisite: Minimum grade of C- in HESP300; or permission of BSOS-Hearing & Speech Sciences department.
Recommended: LING200 or HESP120.
Restriction: Must be in Hearing and Speech Sciences program; or permission of BSOS-Hearing & Speech Sciences department.

HESP402 Language and Phonological Disorders in Children (3 Credits)
Etiology, assessment and treatment of language and phonological disorders in children.
Prerequisite: Minimum grade of C- in HESP400; or permission of BSOS-Hearing & Speech Sciences department.
Restriction: Must be in Hearing and Speech Sciences program.

HESP403 Introduction to Phonetic Science (3 Credits)
An introduction to physiological, acoustic and perceptual phonetics; broad and narrow phonetic transcription; current models of speech production and perception.
Prerequisite: Minimum grade of C- in HESP305; or permission of BSOS-Hearing & Speech Sciences department.
Restriction: Must be in Hearing and Speech Sciences program; or permission of BSOS-Hearing & Speech Sciences department.

HESP406 Acquired Neurogenic Communication Disorders in Adults (3 Credits)
Survey of the dysarthrias and aphasias in adults from an interdisciplinary point of view.
Prerequisite: Minimum grade of C- in HESP300 and HESP305; or permission of BSOS-Hearing & Speech Sciences department.
Restriction: Must be in Hearing and Speech Sciences program; or permission of BSOS-Hearing & Speech Sciences department.

HESP407 Bases of Hearing Science (3 Credits)
Fundamentals of hearing, including the physics of sound, anatomy and physiology of peripheral and central auditory nervous system, psychophysical procedures used in measurement of auditory sensation and perception, and topics in psychological acoustics.
Prerequisite: Minimum grade of C- in HESP311; or permission of BSOS-Hearing & Speech Sciences department.
Restriction: Must be in Hearing and Speech Sciences program; or permission of BSOS-Hearing & Speech Sciences department.
Credit Only Granted for: HESP307 or HESP407.

HESP411 Introduction to Audiology (3 Credits)
An introduction to the field of audiology. Evaluation and remediation of hearing handicaps.
Prerequisite: Minimum grade of C- in HESP311; or permission of BSOS-Hearing & Speech Sciences department.
Restriction: Must be in Hearing and Speech Sciences program; or permission of BSOS-Hearing & Speech Sciences department.

HESP413 Aural Rehabilitation/Habilitation (3 Credits)
The fundamental aspects of aural rehabilitation therapy for both adults and children are introduced to students. Class time will consist of lectures, discussions, and hands-on activities.
Prerequisite: HESP411.
Restriction: Sophomore standing or higher.

HESP415 Principles and Methods in Speech-Language Pathology (2 Credits)
The principles and methods required to provide treatment of speech and language disorders to children and adults. Topics include writing goals and objectives, programming,teaching strategies,session design, data collection, behavior modification and counseling.
Prerequisite: HESP400.
Restriction: Must be in Hearing and Speech Sciences program.

HESP416 Principles and Methods in Audiology (2 Credits)
Relate previous knowledge of anatomy/physiology and pathologies of the auditory system and integrate this information into clinical application.
Prerequisite: Minimum grade of C- in HESP411.
Restriction: Must be in Hearing and Speech Sciences program; and permission of BSOS-Hearing & Speech Sciences department.

HESP417 Principles and Methods in Speech-Language Pathology and Audiology (3 Credits)
The principles underlying the treatment of speech, language and hearing disorders in children and adults.
Prerequisite: HESP400 and HESP411; or permission of BSOS-Hearing & Speech Sciences department.
Restriction: Must be in Hearing and Speech Sciences program; or permission of BSOS-Hearing & Speech Sciences department.

HESP418 Clinical Practice in Speech-Language Pathology and Audiology (3 Credits)
Supervised observation with some direct participation in clinical methods for the treatment of disorders of articulation, fluency, child and adult language; evaluation and habilitation/rehabilitation of hearing impaired children and adults.
Prerequisite: Minimum grade of C- in HESP417.
Restriction: Permission of BSOS-Hearing & Speech Sciences department.
Repeatable to: 6 credits.

HESP420 Deaf Culture and ASL for the CSD Professional (3 Credits)
Studying Deaf Culture and American Sign Language (ASL) is crucial in enhancing the culturally competent practice of allied health/ Communication Sciences and Disorders (CSD) professionals. This course explores the politics of (dis)ability through the lens of the experience of d/Deafness and the emergence of the Deaf community as a linguistic and cultural group in the United States, as well as issues that impact the provision of services to this population.
Prerequisite: HESP202 and EDSP220.
Credit Only Granted for: HESP498A or HESP420.
Formerly: HESP498A.

HESP422 Neurological Bases of Human Communication (3 Credits)
Basic neurology as it pertains to anatomy and physiology substrates of speech and language.
Prerequisite: HESP305; or permission of instructor.
Credit Only Granted for: HESP498 or HESP422.

HESP458 Global Perspectives in Communication Sciences and Disorders (3 Credits)
Provides students with a supervised and multidisciplinary international service learning (ISL) opportunity for the reciprocal exchange of cultural perspectives, knowledge, and skills. Through interactions with Ghana health and educational professionals as well as patients/clients and their families, students will gain perspective on broader health issues such as determinants of health, health disparities, and the global burden of disease. Students will have learning opportunities in governmental and non-governmental organizations (NGOs) to gain knowledge of and experience with varied healthcare and educational systems in under-resourced communities. In addition to observing and working with Ghana Speech-Language Therapists (SLT) and other rehabilitative professionals, students will assist faculty in the provision of educational workshops for professionals and/or outreach activities for the community.
Prerequisite: HESP202, HESP300, HESP311, and HESP400; and one course from (HESP406, HESP411, or HESP402).
Jointly offered with: HESP659.
Restriction: Must be a major in Hearing and Speech Sciences .
Repeatable to: 6 credits.
Credit Only Granted for: HESP659 or HESP458.
Additional Information: This course will require students to travel out of the country.

HESP468 Professional Development in Research and Academia (1 Credit)
The purpose of this seminar is to complement your honors project with practical advice on how to navigate successful careers in research and academia. As you progress through your undergraduate years (especially if you work in a lab), you will likely make several unofficial observations about life as a graduate student, postdoc, or professor, and overhear conversations that include new terminology that may be confusing (e.g., research mentorship, grants, conference abstract, tenure). This can create a mysterious aura around what it is like to obtain your PhD and work in academia generally. In this class, we will cover tips and skills that are often passed along informally in the lab; but here, we will discuss these issues overtly from a range of perspectives, experiences, and best practices.
Restriction: Must be in the Hearing and Speech Sciences Honors program; or permission of Hearing and Speech Sciences department.
Repeatable to: 3 credits if content differs.
Additional Information: This course would be taken for three semesters.

HESP469 Honor Thesis Research (1-3 Credits)
Student will develop thesis proposal, conduct research, analyze results, develop and defend final written document.
Prerequisite: Permission of honors thesis advisor required.
Repeatable to: 6 credits if content differs.

HESP489 Undergraduate Research Experience (1-3 Credits)
Undergraduate research experience working under HESP faculty or outside affiliates.
Prerequisite: HESP202.
Restriction: Permission of BSOS-Hearing & Speech Sciences department; and sophomore standing or higher.
Repeatable to: 6 credits.
Formerly: HESP388.

HESP498 Seminar (3 Credits)
Selected topics in human communication and its disorders.
Restriction: Permission of BSOS-Hearing & Speech Sciences department.
Repeatable to: 6 credits if content differs.

HESP499 Independent Study (1-3 Credits)
A directed study of selected topics pertaining to human communication and its disorders.
Restriction: Permission of BSOS-Hearing & Speech Sciences department.
Repeatable to: 6 credits if content differs.

HGLO - Honors Global Communities

HGLO100 The Student in the University: Global Communities (1 Credit)
Students will develop a sense of community within the program, become familiar with campus resources, gain skills and information to prepare for the Global Experience Semester, and explore the surrounding international community.
Restriction: Must be an entering freshman in the Honors Global Communities Program.
Credit Only Granted for: BSGC100 or HGLO100.
Formerly: BSGC100.

HGLO101 Saving the World With Data (3 Credits)
The world is grappling with many intractable issues, like climate change, pandemics, democratic backsliding, and inequality. How can we use data analysis to help us better understand and work to solve these problems? In this class students will engage with a wide range of issues affecting the entire globe. In addition, they will also gain valuable data science skills by learning the basics of coding in R. No previous programing experience is required.
Restriction: Must be an entering freshman in the Honors Global Communities Program.
Credit Only Granted for: HGLO101 or BSGC101.
Formerly: BSGC101.

HGLO208 Using Data to Answer Hard Questions (3 Credits)
In this class, students will learn more advanced data science techniques and gain an understanding of hypothesis formation and general research design.
Prerequisite: GVPT201 and HGLO101.
Restriction: Must be enrolled in Honors Global Communities Living-Learning Program.
Repeatable to: 6 credits if content differs.

HGLO298 Independent Experiential Learning (3 Credits)
This course guides HGLO students in undertaking substantive, academically rigorous research and/or experiential learning in close collaboration with a faculty mentor.
Prerequisite: HGLO208.
Restriction: Must be enrolled in Honors Global Communities Living-Learning Program.
Repeatable to: 6 credits if content differs.

HGLO396 Exploring Social Issues in Brazil (3 Credits)
This study abroad course will immerse students in the rich and diverse social landscape of Brazil. Through experiential learning, students will critically examine key social issues shaping contemporary Brazilian society, including education, politics, environmental challenges, public policy, and cultural identity. The course will combine academic lectures, site visits, and community engagement activities, offering students a holistic understanding of how these issues intersect and impact Brazilian society. Special emphasis will be placed on the lived experiences of marginalized populations, indigenous communities, and the role of grassroots movements in fostering social change.

HGLO397 Exploring Global Challenges and Solutions in Panama (3 Credits)
This study abroad course utilizes the framework of the UN Sustainable Development Goals (SDGs) to explore and analyze global challenges and solutions in Panama City, Panama. Pre-departure seminars will cover critical issues in Panama and the US, including history, politics, sustainable development, indigenous advocacy, and cultural heritage. Students will utilize data science to understand and analyze challenges related to food security, global health (HIV/AIDS education), human rights, and indigenous advocacy. The travel component includes site visits to non-governmental organizations such as the World Food Programme, Fundacion PROBIDSIDA, and Embera Indian Village, as well as multiple arts and cultural landmarks.
Credit Only Granted for: HGLO398A or HGLO397.
Formerly: HGLO398A.
Additional Information: This is an education abroad course requiring travel during Spring Break.

HHUM - Honors Humanities

HHUM105 Honors Humanities: Introduction to the Arts and Humanities (3 Credits)
Introduction to the university, the different fields of the arts and humanities, and the history of how the university and the humanities have evolved across the world from ancient times to the present. Primary emphasis on reading and discussion of literary artifacts to assess the meaning and social status of the arts and humanities in the past and their personal and social value for the future.
Restriction: Must be an entering freshmen in the Honors Humanities Program.
Credit Only Granted for: ARHU105 or HHUM105.
Formerly: ARHU105.

HHUM106 Honors Humanities: The Humanities in Practice (3 Credits)
The application of the disciplines, methods and traditions of the Humanities to contemporary problems and issues such as social injustice, immigration, income inequality, and the role of social media. Students will apply to such issues the tools of the Humanities: research and historical analysis, critical reasoning, communication and persuasion, ethical debate, and imagination. The course will utilize the institutions of Washington, D.C. to explore contemporary problems and will guide students in the creation of their individual proposals for the capstone project that is the culmination of the curriculum in Honors Humanities.
Recommended: HHUM105.
Restriction: Must be in the Honors Humanities Program.
Additional Information: Priority enrollment will be given to students in Honors Humanities.

HHUM205 Second Year Seminar in Honors Humanities (3 Credits)
Seminar on basic issues and methodologies in the humanities and arts.
Credit Only Granted for: ARHU205 or HHUM205.
Formerly: ARHU205.

HHUM206 Honors Humanities Keystone Project (3 Credits)
Design, execution and completion of students' chosen Keystone Projects in the form of research, creativity, or service. Students will have formulated tentative plans for their projects in HHUM106; in this course they will revise and augment those proposals, articulate their connections with the traditions and methods of the humanities, formulate a work plan for completing the project within one semester, and work with their fellow students to workshop their materials as they develop. The course will culminate in a presentation of the project at the annual Keystone Symposium and with the submission of the project in its final form.

HHUM288 Seminar: Selected Issues in Honors Humanities (3 Credits)
Seminar on important topics in Arts and Humanities for students in the Honors Humanities Program.
Restriction: Must be in the Honors Humanities Program.
Repeatable to: 9 credits if content differs.
Credit Only Granted for: ARHU288 or HHUM288.
Formerly: ARHU288.

HHUM328 Internship in Honors Humanities (1-3 Credits)
Supervised service-learning in Honors Humanities.
Prerequisite: HHUM105; and permission of the Honors Humanities Director.
Restriction: Must be in the Honors Humanities Program.
Repeatable to: 3 credits.
Credit Only Granted for: ARHU328 or HHUM328.
Formerly: ARHU328.

HHUM329 Undergraduate Teaching Assistantship (1-3 Credits)
Supervised pedagogical service-learning in the Honors Humanities curriculum.
Prerequisite: HHUM106, HHUM205, and HHUM105; and permission of the Honors Humanities Director.
Restriction: Must be in the Honors Humanities Program.
Credit Only Granted for: ARHU329 or HHUM329.
Formerly: ARHU329.

HISP - Historic Preservation

HISP200 The Everyday and the American Environment (3 Credits)
An introduction to the theories of the everyday within the context of the American built environment. Focuses primarily on the American experience of underrepresented, minority, and/or immigrant communities; both historical and contemporary. Attempts to challenge what is meant by American in describing the American everyday built environment.Jointly offered with HISP615.

HISP319 Special Topics in Historic Preservation (1-6 Credits)
Students will explore technical aspects of preservation taught by practitioners whose expertise are of special benefit to undergraduate students.
Repeatable to: 12 credits.

HIST - History

HIST106 American Jewish Experience (3 Credits)
History of the Jews in America from Colonial times to the present. Emphasis on the waves of migration from Germany and Eastern Europe; the changing nature of the American Jewish community and its participation in American social, economic, and political life.
Cross-listed with: JWST141.
Credit Only Granted for: HIST106 or JWST141.

HIST108 Freshman/Sophomore Seminar in History (3 Credits)
Seminar for freshmen and sophomores on a specific historical case study and historical "problem," taught by a professor who specializes in the field. Participants will learn about the subject by doing the work of historians: carefully considering primary and secondary sources, discussing them in a seminar format, and preparing original written work drawn upon these materials. Seminar topics will range widely and the offerings will vary each semester; these are "special topics" courses.
Repeatable to: 6 credits if content differs.

HIST108B Freshman/Sophomore Seminar in History; Gandhi: The Individual in History (3 Credits)
Uses the life and legacy of Mohandas K. Gandhi, in modern India and beyond, as a starting point to explore the relationship between individuals in world history and the social contexts that produced them. Topics include non-violence, diet, sexuality, politics, law, technology, the environment, and representations in film and other media.

HIST108C Martin Luther King Jr. (3 Credits)
Examines the life and work of Martin Luther King, Jr. We immediately rethink the image of King who liberals and conservatives construct as a dreamer of better race relations. We engage the complexities of an individual, who articulated a moral compass of the nation, to explore racial justice in post-World War II America. This course gives special attention to King's post-1965 radicalism when he called for a reordering of American society, an end to the war in Vietnam, and supported sanitation workers striking for better wages and working conditions. Topics include King's notion of the "beloved community", the Social Gospel, liberalism, "socially conscious democracy", militancy, the politics of martyrdom, poverty and racial justice, and compensatory treatment. Primary sources form the core of our readings.
Cross-listed with: AAAS298M, AMST189C.
Credit Only Granted for: HIST108C, AASP298M, AAAS298M, or AMST189C.

HIST110 The Ancient World (3 Credits)
Interpretation of select literature and art of the ancient Mediterranean world with a view to illuminating the antecedents of modern culture; religion and myth in the ancient Near East; Greek philosophical, scientific, and literary invention; and the Roman tradition in politics and administration.

HIST111 The Medieval World (3 Credits)
The development of Europe in the Middle Ages; the role of religious values in shaping new social, economic, and political institutions; medieval literature, art and architecture.

HIST113 The Making of Modern Europe (3 Credits)
Evolution of modern nation states since late medieval times. Industrial-economic structure and demography. Emergence of modern secular society.

HIST120 Islamic Civilization (3 Credits)
Introduction to society and culture in the Middle East since the advent of Islam: as a personal and communal faith; as artistic and literary highlights of intellectual and cultural life; and as the interplay between politics and religion under the major Islamic regimes.
Cross-listed with: RELS120.
Credit Only Granted for: HIST120 or RELS120.

HIST122 African Civilization to 1800 (3 Credits)
History of Africa from earliest times to 1800. Topics of study include origins of African societies, Nile Valley civilization, medieval African states and societies, Islam, oral traditions, African slavery and the slave trade, and early African-European interactions.

HIST123 Sub-Saharan Africa Since 1800 (3 Credits)
Overviews early mid-19th-century changes in African societies, European conquest and African resistances in the late 19th-century, colonial states and societies, African nationalisms and decolonization and the independence era. Struggles over social, economic, and political changes are emphasized.

HIST131 The History of the American Dream (3 Credits)
An introduction to the way Americans thought of themselves in the past, and their often conflicting visions of what constituted the American Dream. Central questions will include whether or not Americans have always envisioned their country as a land of equality, opportunity, democracy, and freedom and whether or not their ideas of what these values meant changed or remained the same over time.
Credit Only Granted for: HIST131 or HIST289J.
Formerly: HIST289J.

HIST132 Fighting Slavery (3 Credits)
An examination of the different tools and tactics, means and methods that Americans have used to escape slavery or try to eliminate it.

HIST133 God Wills It! The Crusades in Medieval and Modern Perspectives (3 Credits)
An examination of the identities and convictions both of the Western Europeans who participated in the Crusades and of the Easterners (Muslim, Christian, and Jewish) whom they encountered in the Holy Land. Focuses on the era of the first four great Crusades, from about 1095 to 1215. Consideration of the cultural impact of these movements on both Western Europe and the Middle East.
Cross-listed with: RELS133.
Credit Only Granted for: HIST133, RELS133 or RELS289D.
Formerly: RELS289D.

HIST134 Spies, Assassins, Martyrs, and Witches: Famous Trials in American History (3 Credits)
Examination of some of the most famous trials in American history and their enduring hold on the imagination.

HIST135 Civil Discourse or Urban Riot: Why Cities Don't (Often) Explode (3 Credits)
An examination of the mechanisms that promote peaceful co-existence in urban societies and a discussion of how and why city streets sometimes become violent.
Cross-listed with: JWST289E.
Credit Only Granted for: HIST135 or JWST289E.

HIST136 Moneyland: Business in American Culture (3 Credits)
An exploration of American business culture and institutions from colonial times to the present with emphasis on how inherited and acquired identities (social capital) have shaped Americans' experiences as entrepreneurs, managers, workers, and consumers.

HIST137 Pursuits of Happiness: Ordinary Lives in the American Revolution (3 Credits)
Investigates the search for personal fulfillment unleashed by the American Revolution; explores the many different meanings ascribed to the notion of the "pursuit of happiness" by Americans in the early national period.
Credit Only Granted for: HIST137 or HNUH218A.

HIST142 Looking at America through a Global Lens (3 Credits)
Looking at America will focus on a thematic approach to the study of foreign -- negative and positive -- perceptions of America in the 20th century.
Credit Only Granted for: HIST289I or HIST142.
Formerly: HIST289I.

HIST143 Power, Ritual, and Society in Western History (3 Credits)
Introduces students to influential works of political thinking, in the Western tradition from classical Antiquity to the present, that treat the relationship between power, ritual, and society. Investigates ritual and its relationships to power, both in reality and the imagination of political thinkers.
Credit Only Granted for: HIST289F or HIST143.
Formerly: HIST289F.

HIST146 Comparative History of Crime and Punishment (3 Credits)
Explores the transformation of crime and punishment in England, France, and America over five centuries. Focus is on the connections between forms of government, cultural norms, and punishment. How do ideas about government and its rightful exercise connect to which actions are deemed crimes, who is punished, and how they are punished? "Crimes" covered in this course will range from high crimes such as murder, theft, witchcraft, heresy, sedition, and treason to crimes of property and morals crimes such as non-attendance at church and drunkenness.
Credit Only Granted for: HIST289L or HIST146.
Formerly: HIST289L.

HIST147 History of Satan: Conceptions of Ultimate Evil from Antiquity to the Present (3 Credits)
Traces the concept of Satan in the Jewish and Christian traditions from the Hebrew Bible, through the early modern witch crazes, to the "Satanic Panic" of the '80s and modern conspiracy theories. We'll examine both how our darkest fears have changed over the centuries, and which elements have stayed remarkably consistent across time. In the process, we'll seek to answer our Big Question: How do ideas about the devil reflect the norms and anxieties of the cultures that produce them?

HIST151 Aliens, Brainwashing, and Cybernetics: Science Fiction and the History of Science (3 Credits)
How have humans used art--including but not limited to poems, plays, novels, short stories, and films--to explore the potential consequences of new science and technology? Writers, filmmakers, and artists have often used speculative fiction to comment on new knowledge about the natural world and to think about how that knowledge might affect humanity's future. Some works of art express hope that science and technology will improve the human condition; others express anxiety about the consequences of scientific findings and technological developments. This class examines science fiction (broadly defined) in its historical context and considers how specific works both reflected and shaped changing beliefs about science and its role in society. Students will analyze works of fiction alongside scholarly literature about developments in the history of science.

HIST187 God, Land, Power, and the People: Moral Issues in the Jewish Historical Experience (3 Credits)
Examines the complicated relationship between theology, nationalism, sovereignty, and the ethical exercise of social control using case studies drawn from the Jewish historical experience. The universal and age-old issues implicit in the exercise of power have gained special moral force for Jews with the creation of the State of Israel, a Jewish and a democratic state with substantial non-Jewish minorities and hundreds of thousands of non-citizen subjects. Can these be reconciled? Jewish efforts over the ages and in recent times to define justice provide concrete examples through which to examine and discuss crucial abstract principles.
Cross-listed with: ISRL187, JWST187.
Credit Only Granted for: HIST187, JWST187 or ISRL187.

HIST189 Topics in History (1-3 Credits)
Thematic exploration of a topic in history at an introductory level with emphasis on understanding what historians do and how history is relevant in the contemporary world.
Repeatable to: 6 credits if content differs.

HIST200 Interpreting American History: Beginnings to 1877 (3 Credits)
The United States from colonial times to the end of the Civil War. Establishment and development of American institutions.
Credit Only Granted for: HIST156 or HIST200.
Formerly: HIST156.

HIST201 Interpreting American History: From 1865 to the Present (3 Credits)
The United States from the end of the Civil War to the present. Economic, social, intellectual, and political developments. Rise of industry and emergence of the United States as a world power.
Credit Only Granted for: HIST157 or HIST201.
Formerly: HIST157.

HIST204 Introduction to the History of Science (3 Credits)
An exploration of the roots of modern science from the ancient Greeks through the medieval and early modern periods. Focus on the men and women who helped to create the sciences and to change public perceptions of their disciplines.
Credit Only Granted for: HIST174 or HIST204.
Formerly: HIST174.

HIST205 Environmental History (3 Credits)
An exploration of the way different societies have used, imagined, and managed nature. Includes examination of questions of land use, pollution, conservation, and the ideology of nature, especially but not exclusively in Europe and North America.

HIST206 Introduction to the History of Technology (3 Credits)
Introduction to the history of major technological changes and innovations; examination of the revolutionizing potential of technology.
Credit Only Granted for: HIST175 or HIST206.
Formerly: HIST175.

HIST208 Historical Research and Methods Seminar (3 Credits)
Reading and research skills and methods. Research papers will be based on the topic of the seminar.
Restriction: Must be in History program.
Repeatable to: 6 credits if content differs.
Credit Only Granted for: HIST208 or HIST220.
Formerly: HIST220.

HIST210 Love, Labor, and Citizenship: Women in America to 1880 (3 Credits)
An examination of the economic, family, and political roles of colonial slave, immigrant and frontier women in America from the pre-industrial colonial period through the early stages of 19th-century industrialization and urbanization.
Cross-listed with: WGSS210.
Credit Only Granted for: HIST210, WMST210 or WGSS210.
Formerly: WMST210.

HIST211 Women in America Since 1880 (3 Credits)
An examination of women's changing roles in working class and middle class families, the effects of industrialization on women's economic activities and status, and women's involvement in political and social struggles, including those for women's rights, birth control, and civil rights.
Cross-listed with: WGSS211.
Credit Only Granted for: HIST211, WMST211 or WGSS211.
Formerly: WMST211.

HIST212 Women in Western Europe 1750-Present (3 Credits)
An analysis of the economic, family, and political roles of European women from 1750 to the present. The effects of industrialization on women's work and status, the demographic parameters of women's lives, and women's participation in political events from market riots to suffrage struggles.
Cross-listed with: WGSS212.
Credit Only Granted for: HIST212, WMST212 or WGSS212.
Formerly: WMST212.

HIST213 History of Sexuality in America (3 Credits)
Explores the social construction of sexualities from the first colonial settlement to the modern era in the United States. Analyzes the implications of these understandings for power relations in U.S history.
Cross-listed with: WGSS298L.
Credit Only Granted for: HIST213, WMST298L or WGSS298L.

HIST215 Women in Western Europe to 1750 (3 Credits)
An exploration of the theories and rhetoric about the nature and existence of women in the West, focusing on the experience of women from the hegemony of Classical Greece to the French Revolution, an era that marks the beginning of a continuous process of change. Emphasis will be on the period between 1250 and 1750, when the Western European world was fundamentally altered in every aspect and in every level of society, culture, and government.
Credit Only Granted for: HIST215 or HIST219A.
Formerly: HIST219A.

HIST217 From Mary Wollstonecraft's Vindication to Bridget Jones's Diary: Women and Gender in Modern Britain: 1790-Present (3 Credits)
Starting with Britain's first feminist writer in the 1790s, Mary Wollstonecraft, and ending with the post-feminist fictional Bridget Jones, this course will examine the economic, social, political, and cultural lives of women in Britain since the late 18th century. We will meet famous British women (Queens Victoria and Elizabeth II, Virginia Woolf, Margaret Thatcher, etc) as well as ordinary women (industrial workers, Victorian prostitutes, war nurses and munitions workers, feminist activists, mothers, among others) to understand how class, gender, race, and history intersect. The course aims to provide an introduction to debates about gender and history and employs a variety of primary sources (including novels, autobiography, political pamphlets and social investigations, film) supplemented by secondary sources, to explore women's engagement in public life over the last 230 years.

HIST219 Special Topics in History (3 Credits)

HIST219I Religions of the Ancient Near East (3 Credits)
Introduction to ancient Near Eastern religious systems and mythology, from the third millennium BCE through the fourth century BCE. Particular emphasis on Mesopotamia and ancient Israel.
Cross-listed with: RELS225, JWST225.
Credit Only Granted for: JWST225, HIST219I, RELS225, or RELS219A.
Formerly: RELS219A.

HIST219N Introduction to Humanities, Health, and Medicine (3 Credits)
An overview of the historical, cultural, ethical, and spiritual dimensions of medicine, human health, disease, and death from the points of view of various humanistic disciplines.
Cross-listed with: ARHU230, ENGL254, WGSS230.
Restriction: Permission of ARHU-History Department.
Credit Only Granted for: ARHU230 , ENGL289C, ENGL254, ARHU298A, HIST219N, or WGSS230.

HIST219T Discovering the World of Ancient Rome (3 Credits)
An exploration of the cultural traits and developments of ancient Roman civilization from its roots in Etruscan culture, through the rise of the Roman Republic, to the expansion of Roman cultural influence in the ancient world and the emergence of the Roman Empire. Drawing upon the evidence of the archaeological remains as well as ancient historical and literary documents, students gain a basic familiarity with the principal monuments and artifacts of ancient Roman civilization, the various institutions and values that characterized the Romans, and the significant historical events that transformed the culture over the course of antiquity.
Cross-listed with: CLAS190.
Credit Only Granted for: CLAS190 or HIST219T.

HIST219X Modern Iran (3 Credits)
General sociopolitical introduction to modern Iran from establishment of the Qajar dynasty in the late 18th century to the present day. Taught in English.
Cross-listed with: PERS251.
Credit Only Granted for: PERS251 or HIST219X.

HIST220 The Atlantic World in the Age of Exploration, Conquest, and Settlement (3 Credits)
Study of encounters, exchanges, and clashes between Native Americans, Europeans, and Africans in the early modern Atlantic World. Examines conquest and colonial systems; movement of men and women and mixing of peoples, and the persistence of native folkways.
Credit Only Granted for: HIST219V or HIST220.
Formerly: HIST219V.

HIST221 Asian American History (3 Credits)
Introduction to the history of Asian Americans and Asians in the United States and the Americas and to the field of Asian American Studies, from an interdisciplinary perspective. Topics include theories of race and ethnicity; Asian migration and diaspora to the Americas; Asian American work and labor issues; gender, family, and communities; nationalism and nativism, and anti-Asian movements; Asian Americans in World War II, the Cold War, and the issues in the civil rights & post-civil rights era.
Cross-listed with: AAST201.
Credit Only Granted for: AAST201 or HIST221.

HIST222 Immigration and Ethnicity in America (3 Credits)
The history of immigration and the development of diverse populations i the United States are examined. Topics include related political controversies, the social experiences of immigrants, ethnicity, generations, migration, inter-group relations, race, and diversity in American culture.
Credit Only Granted for: AAST222, HIST222, or SOCY222.

HIST223 Globalizing the American Revolution (3 Credits)
How is the American Revolution a creation story in the making of our multi-cultural and interconnected modern world? Consider the Declaration of Independence. When first published on July 5, 1776, it was printed by an immigrant Irishman on Dutch paper that had been brought over from England. This was the first such declaration of independence ever issued, but its ideas and forms traveled far and wide. More than 100 other declarations of independence have been issued since then. The people that declaration mobilized are similarly diverse: the American Revolution is as much the story of Creek farmers, Spanish soldiers, French slaves, Canadian fugitives, Indian tea-growers, and African statesmen as it is of the Minutemen and Sons of Liberty. In this globe-trotting class, students will be positioned to debate how the familiar story of the American Revolution changes when we place it in transnational context.
Cross-listed with: HNUH218C.
Credit Only Granted for: HNUH218C or HIST223.

HIST224 Modern Military History, 1494-1815 (3 Credits)
Survey of global military history from the European "discovery" of the Americas to the end of the Napoleonic Wars. Explores how the creation of professional armies, advancement of weapons technology, and evolution of military-civilian relations in Europe during these three centuries sparked the "Rise of the West".

HIST225 Modern Military History, 1815-Present (3 Credits)
The military history of Europe through an examination of the economic, financial, strategic, tactical, and technological aspects of the development of military institutions and warfare from the Congress of Vienna in 1815 to the present.

HIST226 Revolution, Regret, and Reform: The People and Principles in American Political History (3 Credits)
Explores American political history from Independence through the present day. Interrogates the roots of American political ideas, the dynamics of partisan competition, the interaction of class, ethnicity, race, and politics, the evolution of policy preferences, the growth of the state, and the transformation of grassroots expectations and ambitions, among other important themes. By exploring the writings of major figures as well as the preferences of anonymous voters--and everyone in between, this course will help students identify the overarching themes and the important forgotten moments in our nation's political development. Students will end the semester armed with a mastery of this history, an understanding of the methods of political historians and scholars in related fields, and a contextualization of our contemporary political world.
Credit Only Granted for: HONR299G or HIST226.
Formerly: HONR299G.

HIST227 Frederick Douglass's America (3 Credits)
What does it mean to be free in the United States? The concept of freedom was embedded in the nation's political culture in the Declaration of Independence, and it has remained a cherished and contested ideal. We can interrogate this concept through the life and times of Frederick Douglass (1818-1895), who dreamed eloquently of freedom, thought carefully about its limits, and worked ardently to build a firmer freedom for a broader population. With Douglass as our guide, we will examine the survival of slavery in a nation built on freedom, images of the expanding United States as a land of opportunity, and the complex meanings and tremendous costs of freedom struggles during the nineteenth century. This history will push you to think critically about the contested concepts that shape our lives, and to consider the values and the perils of a society that positions freedom as its highest ideal.
Credit Only Granted for: HNUH218B or HIST227.
Formerly: HNUH218B.

HIST231 London and the British Empire (3 Credits)
Focuses on the people, places, and policies that shaped the development of the British Empire, the single largest trans-cultural phenomenon in the world since 1500. Students examine how ideology, migration, technology and resistance shaped the expansion and eventual retrenchment of British imperial power in the Atlantic world and the Indian sub-continent. With the nation's capital as our classroom, students explore the complex workings and legacies of the British Empire from the perspective of its nerve center. The curriculum illuminates the experience of empire for subjects both in the colonies and the metropole and will pay particular attention to the maritime origins of empire, the lives of black Britons and the abolition of slavery, and the rise and fall of the British in India.
Cross-listed with: HONR231.
Credit Only Granted for: HIST219K, HONR249B, HONR231, or HIST231.
Formerly: HIST219K.

HIST232 The Historical Development of London (3 Credits)
Study Abroad in London, England. The history of London, beginning with its foundation by the Romans, continuing with the city's progressive political and cultural domination of England, the British Isles and the British Empire, and concluding with a look at the city in the 20th century. Students look at London through the eyes of contemporaries and historians while forming their own impressions of the city during course-based walking tours of the city.
Restriction: Permission of Study Abroad Office required.
Credit Only Granted for: GNED288 and HIST232.
Formerly: GNED288.

HIST233 Empire! The British Imperial Experience 1558-1997 (3 Credits)
Britain's empire from the mid-sixteenth century to the late twentieth century, focusing on the encounter between Britain and indigenous peoples. Topics include the origins of British imperialism in Ireland and North America, the slave trade, the East India Company and India, women in empire, transportation and the making of Australia, sex in empire, missionaries, racial theories, and decolonization.
Credit Only Granted for: HIST219P or HIST233.
Formerly: HIST219P.

HIST234 Invaders, Conquerors, Usurpers: A History of Pre-Modern Britain to 1485 (3 Credits)
British history from Roman times to the 15th century. The Anglo-Saxon, Scandinavian, and Norman invasions; the coming of Christianity; Magna Carta, the development of Parliament, legal institutions, and the Common Law; the decline of medieval kingship.

HIST235 Divorced, Beheaded, Deposed: England and Britain 1485-1689 (3 Credits)
British history from the War of the Roses to the Hanoverian succession; Yorkist and Tudor society and politics; the Renaissance and Reformation in England, Henry VIII through Elizabeth I; 17th-century crises and revolutions; intellectual and cultural changes; the beginnings of empire; the achievement of political and intellectual order.

HIST236 From Peacocks to Punks: Modern Britain from 1688 to Today (3 Credits)
British history from the Glorious Revolution of 1688 to the present. The revolution of 1688; the structure of 18th-century society and politics; economic and social change in the Industrial Revolution; 19th- and 20th-century political and social reform; imperialism; the impact of the First and Second World Wars on British society.

HIST237 Russian Civilization (3 Credits)
An overview of Russian history stressing the main lines of development of the Russian state and the evolution of Russian culture to the present day.

HIST240 Europe in the Twentieth Century (3 Credits)
Political, cultural, and economic developments in 20th-century Europe.
Credit Only Granted for: HIST240 or HIST337.
Formerly: HIST337.

HIST241 The Soviet Century (3 Credits)
The twentieth century was the "Soviet Century," or a twentieth century defined by the Soviet Union's birth, growth and demise. Beginning with this premise, the course starts with the revolutionary seeds of Soviet rule, the Russian empire and the revolution of 1905, and concludes with an examination of the former Soviet space in the aftermath of the Soviet collapse in 1991. Key topics include: 1) The origins, timing and intent of state-sponsored violence and terror 2) Agricultural and industrial modernization and 3) The Soviet Union as a new type of multi-ethnic state or empire. The last theme will get particular emphasis, and the course seeks to dismantle the long-standing notion that "Russian" and "Soviet" are the same thing. Instead, it emphasizes the Soviet Union as a multi-ethnic, multi-confessional society, one in which Russians interacted with myriad other ethnic groups, including Ukrainians, Kazakhs, Tatars, Armenians, Lithuanians, Tatars and others.

HIST244 What Do Conspiracy Theories Reveal about American History? (3 Credits)
Explores a range of conspiracy theories and moral panics from the colonial period to the early twenty-first century by explaining the historical conditions under which conspiracies took root and the fears and anxieties underlying paranoia in American history

HIST245 Reformers, Radicals, and Revolutionaries: The Middle East in the Twentieth Century (3 Credits)
The 20th century was a period of dramatic changes in the Middle East. Within the global context of the two World Wars and the Cold War, countries in the region struggled with the effects of colonialism and painful processes of decolonization. The course offers a thematic-comparative approach to issues such as social and political reform, nationalism, the colonial experience, independence struggles, models of governance, political violence, and Islamism. Course lectures and the analysis and discussion of primary sources will lead students to understand that the peoples of the Middle East found answers to the challenges posed by Western dominance based on their specific historical, cultural and socio-economic circumstances.
Cross-listed with: RELS219K.
Credit Only Granted for: RELS219K or HIST245.

HIST247 Modern India and South Asia (3 Credits)
Surveys the making of modern India, as well as Pakistan and Bangladesh, from the onset of colonialism in the 18th century to the present day. Focuses on three key themes: state formation and the persistence of regional identities; the negotiation of religious, ethnic, caste, and gender differences; and economic development and inequality.
Credit Only Granted for: HIST219J or HIST247.
Formerly: HIST219J.

HIST250 History of Colonial Latin America (3 Credits)
Introductory survey of the history of Latin America from pre-Columbian Indian cultures to the beginning of the wars for independence (ca. 1810), covering cultural, political, social, and economic developments. Major themes include conquest, colonialism, indigenous culture, African slavery, religion, race and ethnicity, and gender ideologies.
Cross-listed with: LACS250.
Credit Only Granted for: LASC250, HIST250, OR LACS250.
Formerly: LASC250.

HIST251 Latin America Since Independence (3 Credits)
Introductory survey of the history of Latin America from the era of independence (c. 1810-1825) through the early 1980s. Major themes include independence and sovereignty, postcolonialism and neocolonialism, nation- and state-building, liberalism, citizenship, economic development and modernization, social organization and stratification, race and ethnicity, gender relations, identity politics, reform and revolution, authoritarianism and democratization, and inter-American relations.
Cross-listed with: LACS251.
Credit Only Granted for: HIST251, LASC251, or LACS251.
Formerly: LASC251.

HIST254 African-American History to 1865 (3 Credits)
Survey of the principal developments in the history and culture of the peoples of African descent in colonial North America and the United States to 1865. Examines the African past, the Atlantic slave trade, variation in slavery, the growth of free black communities, the transformations of families and cultural forms, and patterns of resistance.
Cross-listed with: AAAS254.
Credit Only Granted for: HIST254, AAAS254 or AASP298C.

HIST255 African-American History, 1865 - Present (3 Credits)
An introductory course in the African-American experience in the United States from 1865 to the present. Topics include the aftermath of the Civil War on US race relations, the rise of segregation, northern migration, World War I and II, Civil Rights Movements, and the Black Power Movement.
Cross-listed with: AAAS255.
Credit Only Granted for: HIST255, AASP255, AAAS255 or AASP298A.

HIST261 Medicine in an Age of Empires, 1500-1800 (3 Credits)
An introduction to the broad shifts in European medicine of early modern period, a period that saw the extension of overseas empires and the emergence of medicine as a profession. The course offers a thematic and comparative look at the intertwined experiences of disease, empire, and global commerce that reshaped expectations of what medicine could or should do, for whom, and at what cost.

HIST262 A Green Giant? Environmentalism and Technology in Germany, Today and Yesterday (3 Credits)
Focuses on Germany's role as an economic and technological powerhouse and its claim to be a global environmental leader, both in the past and today. Germany is one of the leading export nations globally, with its automobiles and machinery being sold all over the world. Green technologies made in Germany leave their mark worldwide. But its businesses, scientists, and engineers have also been involved in the darkest chapters in human history: the rise of Nazism and the Holocaust. The city of Munich will be our classroom, with its global companies, memorial sites, and museums as sites of learning and discussion. With readings, visits, guided tours, and discussions, students will explore and examine German's reputation as a green nation and technological powerhouse.
Cross-listed with: GERS262.
Credit Only Granted for: GERS262 or HIST262.

HIST266 The United States in World Affairs (3 Credits)
A study of the United States as an emerging world power and the American response to changing status in world affairs. Emphasis on the relationship between internal and external development of the nation.

HIST269 Special Topics in Study Abroad II (1-6 Credits)
Special topics course taken as part of an approved study abroad program.
Repeatable to: 15 credits if content differs.

HIST270 Science Fiction, Afrofuturism, and Colonialism (3 Credits)
Explores the history of science fiction writing in the context of genuine historical events and issues in the background of authors and in the narratives they create. There is a deep intersection with colonialism and racism -- one which was then traduced by two generations of sci-fi authors, and via Afrofuturism and dystopian Scifi, who turned around the genre to create a new set of plots and social messages. Students will leave the class with an appreciation of the difference between historical methodology and narrative, whether under the guise of fiction or speculative nonfiction. Students will encounter and understand cinematic and visual vocabularies as well as textual tropes.

HIST281 Inventing Traditions: The Making of Rabbinic Judaism (3 Credits)
Introduces the dramatic literary and cultural (as well as political and demographic) innovations that reshaped Judaism in late antiquity. Examines the fundamental works and genres of rabbinic literature and the religious movement that produced them. Special emphasis on the rabbinic uses of "tradition" to enhance authority and legitimacy, and to foster group identity.
Cross-listed with: JWST230, RELS230.
Credit Only Granted for: HIST281, JWST230, RELS219C or RELS230.
Formerly: RELS219C.

HIST283 History of the Jewish People II (3 Credits)
Political, economic, social, and cultural development within Jewish history from the end of Middle Ages to the present. Special attention to twentieth-century developments including the Nazi holocaust and its aftermath, the Zionist movement and the creation of the State of Israel; rise of the contemporary American Jewish community.
Credit Only Granted for: HIST283, HIST283H, JWST235, or JWST235H.

HIST284 East Asian Civilization I (3 Credits)
An interdisciplinary survey of the development of East Asian cultures. An historical approach drawing on all facets of East Asian traditional life, to gain an appreciation of the different and complex cultures of the area.

HIST285 East Asian Civilization II (3 Credits)
A survey of the historical development of modern Asia since 1700. Primarily concerned with the efforts of East Asians to preserve their traditional cultures in the face of Western expansion in the 18th and 19th centuries, and their attempts to survive as nations in the 20th century.

HIST286 Urban Dreams and Nightmares: The Jewish Experience of Cities (3 Credits)
Cities give expression to man's power while they highlight human limitations. It is urban social diversity that makes great wealth and thriving culture possible, but it also fixes discrimination behind walls constructed from paper and stone. Nations make cities symbols of the sacred and the glorious, while they ignore the poverty and social alienation that city life breeds. Jews, intensively urbanized for millennia, provide a special vantage point from which to study the beauty and the tragedy implicit in city-building. Our sources will include the Bible, poems, plays and novels but also US Supreme Court rulings and news of riots in Israel. We will survey how Jews have shaped, and been shaped by, the urban challenge over time and space.
Cross-listed with: JWST275.
Credit Only Granted for: HIST286 or JWST275.

HIST287 Why the Jews? Historical and Cultural Investigations (3 Credits)
Examines the history and culture of the Jews from the thirteenth century BCE/BC to the present through an examination of significant themes or problems (such as "religion" or "diaspora") that shape our understanding of the Jewish people. A primary focus in the course will be on texts, artifacts, and other cultural products by Jews and others that illustrate the history of the Jews help understand their cultural heritage.
Restriction: Must not have completed HIST282, HIST283, JWST234, or JWST235. Cross-listed with JWST233.
Credit Only Granted for: HIST287 or JWST233.

HIST289A Jews, Christians, and Muslims in Medieval Spain: Tolerance, Oppression, and the Problematic Past (3 Credits)
For 800 years, medieval Spain was home to one of the most religiously diverse societies in European history. Despite frequent hostilities, the interactions of Spanish Jews, Christians, and Muslims produced a flowering of science, theology, and literature in an often remarkably tolerant climate. Students will learn how medieval Spanish people themselves experienced interreligious contact and conflict. They will also discover the modern pressures, prejudices, and ideals that have shaped historians interpretations of medieval Spain.
Cross-listed with: RELS289C.
Credit Only Granted for: HIST289A or RELS289C.

HIST289N The Politics of Sexuality in America: A Historical Approach (3 Credits)
Why do particular issues about sexuality hold such an important place in American political debates? What animates these controversies and what can a historical perspective on these issues add to our understanding of modern sexual politics? This class explores the historical sexual politics that undergird contemporary debates concerning sexuality in America. It focuses on topics that garner significant public attention - Reproductive rights - LGBTQ rights - Sexting - and explores the histories that undergird Americans disagreements.
Cross-listed with: WGSS298N.
Credit Only Granted for: HIST289N or WGSS298N.

HIST289O Lawlessness: From Pirates to Body-snatchers, Exploring the Legitimacy of Illicit Activity (3 Credits)
Explores motives of and responses to the lawless behavior of pirates, body snatchers, bandits, vigilantes, smugglers and others worldwide from the 1500s to today.

HIST289R Pocketbook Politics: A History of American Buying and Selling (3 Credits)
Provides a thematic approach to consumerism as it emerged in the United States over the course of three centuries. The history of consumption is a prism through which many aspects of social and political life may be viewed. How does what we wear, what we listen to, or what we eat shape our identities?

HIST289T Jesus, Mani, and Muhammad: The Dynamics of New Religious Movements (3 Credits)
We examine three significant ancient religious figures: Jesus (d. 30s CE), Mani (d. 276 CE), and Muhammad (d. 632). All three were founders of long-lasting religions that were part of a dramatic change in the society and religion of the ancient world. Special areas of focus: the biographies of these founding figures, and how we know them; a historical approach to religious founders; and the sociology of new religious movements.
Cross-listed with: RELS273.
Credit Only Granted for: RELS273 or RELS289M or HIST289T.
Formerly: RELS289M.

HIST289V What Does It Mean to be An American? (3 Credits)
This course seeks to understand the on-going crisis over national identity and purpose by examining the many factors that go into the big stew known as America.

HIST289Y Zombies, Fear, and Contagion: A Cultural History of Public Health, Medicine, and Technology (3 Credits)
Historically examines how our fear of zombies reflects changing fears about the body, and anxieties about western medical and technological advancements.

HIST290 Can Jews be Arabs? Identity and Crisis for the Jews of Arab Lands in Modern Times (3 Credits)
For centuries, Jews inhabited the Islamic lands of the Middle East and North Africa. Their population has dropped from nearly one million a century ago to several tens of thousands today, mostly in Turkey and Iran. The vibrant and ancient Jewish communities of Iraq, Egypt, Syria, Morocco, Algeria, Libya, and several other countries were practically gone by 1970. One popular explanation for this exodus is that an "age-old schism between Jews and Muslims," in the words of the prominent historian Martin Gilbert, drove Jewish men and women to leave their historic homelands in the years following the first Arab-Israeli war of 1948. However, recent research into these communities offers a more complex picture of their lives in Islamic lands in the 19th and 20th centuries and subsequent departure.
Cross-listed with: JWST290.
Credit Only Granted for: JWST289A, HIST219C or HIST290.

HIST291 Jewish Texts and Cultures of the Second Temple Period (3 Credits)
An introduction to the literature, history, and culture of Jews in the period between the sixth century BCE and the second century CE. Special topics may include the rise of the formation of the biblical canon, scriptural interpretation, sectarian and revolutionary movements, and growth of the diaspora.
Cross-listed with: JWST231.
Credit Only Granted for: HIST291 or JWST231.

HIST299 Directed Research (1-3 Credits)
Closely guided research in primary sources for students currently enrolled in selected 100- or 200-level surveys in the Department of History.
Restriction: Permission of ARHU-History department.
Repeatable to: 9 credits if content differs.

HIST304 The Baddest Decade: The 1970s in American Film and American History (3 Credits)
The history of the United States and of its cinema in the 1970s.
Cross-listed with: CINE352.
Credit Only Granted for: CINE352, FILM352 or HIST304.
Formerly: FILM352.

HIST306 History of Religion in America (3 Credits)
A history of religion, religious movements, and churches in America from the early Colonial period to the present, with special attention to the relation between church and society.
Cross-listed with: RELS346.
Credit Only Granted for: HIST306 or RELS346.

HIST307 The Holocaust of European Jewry (3 Credits)
Roots of Nazi Jewish policy in the 1930's and during World War II: the process of destruction and the implementation of the "final solution of the Jewish problem" in Europe, and the responses made by the Jews to their concentration and annihilation.
Cross-listed with: JWST345.
Credit Only Granted for: HIST307 or JWST345.

HIST310 History of South Africa (3 Credits)
Explores the roots of Apartheid and the anti-Apartheid movement from precolonial times to the present: the social history of work and identity, the rise of kingdoms (Zulu, Sotho), conquest and colonial administration, urban and rural mass politics, gender relations, and the transition to democracy.
Formerly: HIST419E.

HIST319 Special Topics in History (3 Credits)
Repeatable to: 6 credits if content differs.

HIST320 Early Christianity: Jesus to Constantine (3 Credits)
Social and religious history of early Christianity from its origin in the first century to the reign of Constantine.
Cross-listed with: JWST331.
Credit Only Granted for: HIST320 or JWST331.

HIST321 Archaeology and the Quest for Ancient Israel (3 Credits)
The Hebrew Bible/Old Testament tells the story of "Biblical Israel" in ways that overlap with but are not identical to the evidence for "ancient Israel" provided by archaeological sources. Close attention to archaeology and inscriptional evidence allows for an understanding of biblical literature in light of its ancient Near Eastern context. Primary focus is on the Iron Age (ca. 1200-540 BCE), whose archaeology and inscriptions will be explored alongside biblical texts set during the this period but often written much later. Class discussion will address modern controversies regarding ancient Israel, including questions of origins (what does proto-Israelite mean?), problems of historiography (minimalist vs. maximalist), and archaeological dating (low chronology vs. high chronology).
Cross-listed with: JWST324.
Credit Only Granted for: HIST321 or JWST324.

HIST324 Classical Greece (3 Credits)
The ancient Greeks from Homer to Socrates, 800-400 B.C. Society and religion of the city-state, the art and literature of Periclean Athens, the Peloponnesian War, and the intellectual circle of Socrates.

HIST325 Alexander the Great and the Hellenistic Age (3 Credits)
History of the Greeks 400-30 B.C.: Alexander and the changes he wrought in the Mediterranean world; the rise of monarchies and leagues; new directions in religion, art, literature, and science; and Hellenization of the Near East, including the Jews.

HIST326 The Roman Republic (3 Credits)
Ancient Rome 753-44 B.C., from its founding to the assassination of Julius Caesar. Rome's conquest of the Mediterranean world, the social and political forces that brought it about, and the consequent transformation and decline of the Republic.

HIST327 The Roman Empire (3 Credits)
Roman history from Augustus to Heraclius, 44BC-641AD: The Imperial court and government; the diversity of culture in provinces and cities and the progress of Romanization; Roman religion and its transformation in late antiquity; the Roman army and defense of the frontiers.

HIST328 Selected Topics in History (3 Credits)
Repeatable to: 9 credits.

HIST328D Inventing Ancient Greek Culture (3 Credits)
Who were the ancient Greeks, and were they the founders of Western civilization' The course examines the foundations of ancient Greece. Through an analysis of the historical, archaeological, and linguistic evidence, it sheds light on the so-called Black Athena Controversy, which raised doubts about the ancient Greek contribution to Western culture. The course also focuses on the impact of modern identity politics on scholarly discussions of antiquity and the ways in which the Culture Wars of the 1980s and 1990s have influenced analyses of the ancient Greek world.
Cross-listed with: CLAS311.
Credit Only Granted for: CLAS311 or HIST328D.

HIST328W Women in Classical Antiquity (3 Credits)
A study of women's image and reality in ancient Greek and Roman societies through an examination of literary, linguistic, historical, legal, and artistic evidence; special emphasis in women's role in the family, views of female sexuality, and the place of women in creative art. Readings in primary sources in translation and modern critical writings.
Cross-listed with: CLAS320, WGSS320.
Credit Only Granted for: CLAS320, WMST320, WGSS320 or HIST328W.

HIST329 Special Topics in History (1-3 Credits)
Repeatable to: 9 credits.

HIST330 Europe in the Making: The Early Medieval West (A.D. 300-1000) (3 Credits)
From one empire to another. Rome to Charlemagne. This period is approached as a crucible in which classical, Christian, and Germanic elements merged, yielding new experimental syntheses. This course will deal with issues of authority, cultural trends, and the formation of group solidarity.
Cross-listed with: RELS340.
Credit Only Granted for: HIST330 or RELS340.

HIST331 Europe in the High Middle Ages: 1000-1500 (3 Credits)
Medieval civilization in the 11th through 15th centuries. Emphasis on cultural and political developments of the high Middle Ages with study of the principal sources of medieval thought and learning, art and architecture, and political theory prior to the Renaissance.
Cross-listed with: RELS341.
Credit Only Granted for: HIST331 or RELS341.

HIST332 Renaissance Europe (3 Credits)
Intellectual developments in Italy and Northern Europe from 1300 to 1550 and their influence on the arts and religion; social and economic trends, including the rise of the commercial economy in cities; the family and the role of women in society; expansion of Europe overseas and the beginnings of colonization; emergence of the state and consequent changes in political theory.
Cross-listed with: RELS342.
Credit Only Granted for: HIST332 or RELS342.

HIST333 The European Reformations (3 Credits)
Examination of developments in European religion between 1450 and 1700; the late-medieval Church and its critics; rise of Protestant thought in Germany and its spread throughout Europe; reform efforts in the Catholic Church; religious wars and violence and their impact on state and society; consequences of religious reform in society and its impact on the family and women.
Cross-listed with: RELS343.
Credit Only Granted for: HIST333 or RELS343.

HIST338 Special Topics in History (3 Credits)
Thematic exploration of a topic in history.
Repeatable to: 9 credits if content differs.

HIST339 Special Topics in History (3 Credits)
Thematic exploration of a topic in history.
Repeatable to: 9 credits if content differs.

HIST339G Greek and Roman Athletics (3 Credits)
The origin and evolution of athletics in ancient Greece and Rome studied as recreation, as play, as education, as a profession and as mass entertainment.
Cross-listed with: CLAS315.
Credit Only Granted for: CLAS315 or HIST339G.

HIST339J Ancient Slavery and its American Impacts (3 Credits)
Interrogates how slavery permeated the ancient Mediterranean societies of Greece and Rome. We will pay particular attention to how hierarchical inequalities are institutionalized, experienced, and represented and to how different marginalized and dominant groups interacted. Enslaved persons performed necessary labor in Greece and Rome and their work was essential for the formation of ancient society in agriculture, mining, domestic spaces, literature, finance, and government. Studying ancient slavery offers a chance to examine Greece and Rome from the bottom up, parsing the scant literary and material evidence for the lives and struggles of enslaved persons. We will practice several different approaches in order to tease out the systematic, economic, political, and personal effects of slavery in the ancient world. The United States of America was also founded as a slave society, and discussions of slavery in the Americas often look back to the ancient Mediterranean. The course will therefore conclude with a unit on how enslavers and abolitionists in the United States utilized and responded to slavery in antiquity.
Cross-listed with: CLAS340.
Credit Only Granted for: CLAS340 or HIST339J.

HIST343 Empires, Revolutions, and Cold Wars: Modern Central and Eastern Europe (3 Credits)
We live in an international system upended by Russia's full-scale invasion of Ukraine in 2022. Central and Eastern Europe -- a region largely taken for granted since the end of the Cold War -- is now once again the key battleground for the future of the rules-based global order. This course will offer a broad overview of that region's history since the late 1700s -- through empires, revolutions, and cold wars -- and provide students with the critical tools to develop their own views on that history.
Credit Only Granted for: HIST328L or HIST343.
Formerly: HIST328L.

HIST345 From Body Snatchers to Jack the Ripper: Scandal and Crime in Victorian Britain (3 Credits)
Rumors of the Queen's affairs, grave robbers feeding the medical profession's study of anatomy, female poisoners terrifying the nation's husbands, white slave traders at train stations, and a serial killer targeting London's poorest prostitutes: These are just some of the cases we will use to explore the larger social, legal, moral, and political context of 19th Century Britain and the role of the media in creating sensation and scandal. This course will answer such questions as: Why was the Victorian public fascinated by murder, whether done by an unhappy wife or a Jekyll-Hyde figure lurking at night in London's slums? What do certain crimes and scandals tell us about what it meant to be "Victorian," and how certain stereotypes we may have about Victorians today are not true at all? How did these scandals/crimes become part of popular culture at the time and how/why do they continue to be part of the entertainment we enjoy today?
Credit Only Granted for: HIST329P or HIST345.
Formerly: HIST329P.

HIST352 America in the Colonial Era, 1600-1763 (3 Credits)
The founding of the English colonies in America and their European backgrounds, the reasons for the instability of colonial society to 1689 and the emergence of stable societies after 1689; the development of colonial regionalism, political institutions, social divisions, the economy, religion, education, urban and frontier problems in the eighteenth century.
Prerequisite: HIST200, HIST210, HIST213, or HIST254; or must have completed HIST156; or permission of instructor.

HIST353 America in the Revolutionary Era, 1763-1815 (3 Credits)
The background and course of the American Revolution and early nationhood through the War of 1812. Emphasis on how the Revolution shaped American political and social development, the creation of a new government under the Constitution, and the challenges facing the new nation.

HIST354 Ante-Bellum America 1815-1861 (3 Credits)
Traces how the strong nationalism after the War of 1812 transformed int the sectionalism that led to Civil War. The course concentrates on the controversies over slavery and other issues contributing to North-South antagonism, including Jacksonian democracy, capitalism, racism, immigration, manifest destiny and religious, social, and intellectual movements, each of which produced its own social tendencies and tensions.

HIST355 Civil War and the Rise of Industrialization, 1860-1900 (3 Credits)
Civil War, sectional and class conflicts and their impact on American life and institutions from the beginning of the Civil War through the Gilded Age; social, economic, and political reconstruction of the Union; industrialization, urbanization, and technological changes.
Credit Only Granted for: HIST355 or HIST364.

HIST356 Emergence of Modern America, 1900-1945 (3 Credits)
The emergence of modern institutions and identities, 1900-1945. These institutions may include corporate enterprises and the welfare state; identities include homosexuality, the New Woman, and the New Negro.

HIST357 Recent America: 1945-Present (3 Credits)
American history from the inauguration of Harry S. Truman to the present with emphasis upon politics and foreign relations, but with consideration of special topics such as radicalism, conservatism, and labor.

HIST360 Women and the Civil Rights Movement (3 Credits)
Twentieth-century U.S. civil rights movement from the vantage point of women, considering both women's involvement in the legal campaigns and political protests and the impact of civil rights struggles on women's condition, status, and identity.

HIST361 Metropolitan Change and Modern America: Cities, Suburbs, Hinterlands (3 Credits)
An exploration of the forces that have transformed metropolitan and rural life since the mid-19th century. What role have politics, policy, economics, and ideology/culture played in creating an urbanized and then a "suburbanized" nation?
Credit Only Granted for: HIST419B or HIST361.
Formerly: HIST419B.

HIST363 Mobility in History: Planes, Trains, Automobiles (3 Credits)
From walking, bicycling, riding ships and trains to driving cars and to flying: Humans and their modes of transportation have changed dramatically in history. In this class, students will explore the social, cultural, and environmental aspects of passenger and freight transportation in the 19th and 20th centuries. The focus is on the societal expectations and imaginations that have shaped how humans move about.
Credit Only Granted for: HIST329X or HIST363.
Formerly: HIST329X.

HIST369 Special Topics in Study Abroad III (1-6 Credits)
Special topics course taken as part of an approved study abroad program.
Repeatable to: 15 credits if content differs.

HIST370 Jews and Judaism in Antiquity I: Sixth Century BCE through the First Century CE (3 Credits)
Political, social, and religious history of the Jews from the Persian period to the Judean revolt of 66-70 CE. Special attention to the rise of sectarian and revolutionary movements.
Cross-listed with: JWST325.
Credit Only Granted for: HIST370 or JWST325.

HIST371 Jews and Judaism in Antiquity II: First through Seventh Century (3 Credits)
Political, social, and religious history of the Jews from the destruction of the Jerusalem Temple in 70 CE to the Muslim conquests. Special attention to the political transformations in Judaism under late Roman Christianity, and the rise of the Rabbinic movement.
Recommended: HIST370.
Cross-listed with: JWST326.
Credit Only Granted for: HIST371 or JWST326.

HIST373 Martyrs & Merchants, Lawyers & Mystics, Magicians & Messiahs: Jews Between Medieval and Modern Times (3 Credits)
In an era marked by traumatic expulsions, inquisitorial barbarism, and enforced ghettoization, Jews reinvented themselves. Through their international networks of trade, Jews learned how to negotiate with kings and to govern new, large urban communities in new lands. They took advantage of the printing press to reorganize their literary traditions of law, biblical studies and mysticism, and created new hierarchies of religious status. And they flocked to hear new kinds of enthusiast preachers, celebrating the man they saw as the messiah finally come. We will together explore the contradictory forces that ultimately gave birth to the modern Jew.
Recommended: HIST287 or JWST233; HIST 332; .
Cross-listed with: JWST333.
Credit Only Granted for: JWST333 or HIST373.

HIST375 Modern Jewish History II: World Jewry Since 1870 (3 Credits)
Social, political, economic, and cultural change in the Jewish world since 1870. Emphasis on emancipation, assimilation, and new forms of Jewish identity in Western and Eastern European Jewry from the 19th Century to the present.Cross-listed with JWST344.
Credit Only Granted for: HIST375 or JWST344.

HIST376 History of Modern Israel (3 Credits)
History of modern Israel since the beginning of the Zionist settlement in 1882. Attention to different interpretations and narratives of Israel's history, including the historical and ideological roots of Zionism, the establishment of the State of Israel, ideological forces, wars, and the triumphs and crises of democracy.Cross-listed with ISRL342.
Credit Only Granted for: HIST376 or ISRL342.

HIST377 Mizrahi Identity in Israel (3 Credits)
It is impossible to understand Israeli society today without examining the Mizrahi experience. Despite the common misconception that Israel is predominantly made up of Jews from European origin, the fact of the matter is that Jews of Mizrahi origin, whose parents and grandparents immigrated to Israel from the Middle East and North Africa, represent a major part of the Israeli population. Moreover, Ashkenazi-Mizrahi relations continue to be a major source of tension in Israeli politics, and issues of race continue to come up on social media and polarize the Israeli society. This course brings to light narratives of Mizrahi identity in Israel and explores the trajectory of the Mizrahi struggle for equality and against racism through its various milestones: the 1959 Wadi Salib Revolt, the Black Panthers Movement in the 1970s, the emergence of the Israeli Sephardi-Orthodox party Shas, and the new wave of Mizrahi activism in the 21st century.
Cross-listed with: ISRL330, JWST334.
Credit Only Granted for: JWST319D, JWST334, HIST377, HIST329Z, ISRL329M, or ISRL330.
Formerly: ISRL329M.

HIST381 The Israeli Settler Movement: The Road to One State? (3 Credits)
Explores the Israeli settler movement over the last four decades, from its position on the fringes of Israeli society in the 1970s and 1980s to its rise to prominence in Israeli politics today. Topics will include the history of the Israeli settlement project in the West Bank, the emergence of Gush Emunim and its ideological foundations in Jewish messianism, its violent offshoots, and the influence of the settler movement on the Israeli political system. Study of these topics illuminates some of the most important driving forces of modern history such as nationalism, religious fundamentalism, colonialism and the ability of a determined minority to influence a country's policies.
Cross-listed with: JWST332, ISRL344.
Credit Only Granted for: HIST329G, HIST381, ISRL329G, ISRL344, JWST332 or JWST319N.
Formerly: JWST319N.

HIST382 Law and Culture in Late Imperial China (3 Credits)
An exploration of Chinese law and its social/cultural implications in the late imperial period (1550s-1900s). Major interpretations of the conceptions of law and justice, the functioning of the judicial system, and local courts. An introduction to society and culture, politics and the bureaucracy, family and gender relations, and literature and popular religion of China through the lens of law.

HIST383 City God, Dragon Boat, and Monkey King: Popular Culture and Society in Imperial China (3 Credits)
Explores popular culture, society, and religion in China, with a focus on the late imperial periods (1368-1911). Together we will read and discuss a variety of (translated) primary sources and secondary sources, including the famous sixteenth-century popular novel The Journey to the West, which features the adventures of the powerful Monkey King in his quest for pleasure, immorality, and salvation. We will raise and address questions about popular culture, vernacular literature, folk religion, ritual operas, and everyday life of ordinary people in late imperial China.
Credit Only Granted for: HIST319A or HIST383.
Formerly: HIST319A.

HIST384 Global History of Capitalism (3 Credits)
Surveys the development of capitalism since the 1500s from a global perspective, focusing on Asia, Africa, and Latin America. Topics include markets, entrepreneurship, commodity flows, labor migration, conflicts between states and empires, and environmental impacts. Engagement with primary sources and key debates, tracking changing ideas and interpretations of capitalism over time.
Credit Only Granted for: HIST329L or HIST384.
Formerly: HIST329L.

HIST386 Experiential Learning (3-6 Credits)
The History Department's Internship program. Pre-professional experience in historical research, analysis, and writing in a variety of work settings.
Restriction: Permission of ARHU-History department; and junior standing or higher.

HIST395 Honors Colloquium I (3 Credits)
History and theory: the conceptual underpinnings of the historical discipline. Students evaluate several contrasting theories of history. Prerequisite for other honors courses.
Restriction: Permission of ARHU-History department; and must be in History program.

HIST396 Honors Colloquium II (3 Credits)
Uses a seminar approach to examine a major problem of historical interpretation across two or more diverse cultures in different periods. Topics vary and include: religion and society, the city in history, gender, slavery and emancipation, and modernization.
Prerequisite: Permission of ARHU-History department; or HIST395.
Restriction: Must be in History program.

HIST398 Honors Thesis Directed Study (2 Credits)
Individual research and preparation of History Honors Theses.
Prerequisite: HIST395 and HIST396.
Corequisite: HIST399.
Restriction: Must be in History Honors program.
Repeatable to: 4 credits if content differs.
Additional Information: This course must be taken twice to fulfill the requirements for the honors program in history.

HIST399 Honors Thesis Senior Seminar (1 Credit)
Senior seminar with honors director. Focus on preparation of thesis.
Prerequisite: HIST395 and HIST396.
Corequisite: HIST398.
Restriction: Must be in the History Honors program.
Repeatable to: 2 credits if content differs.
Additional Information: This course must be taken twice to meet the requirements for the honors program in history.

HIST401 Science and Gender (3 Credits)
Examines the role of women and gender in the history of science. Includes consideration of barriers to women's participation in science; women's role as scientific subjects and researchers; and questions about the scientific construction of gender and the gendered construction of science.
Credit Only Granted for: HIST401 or HIST429R.
Formerly: HIST429R.

HIST403 Trashed! Garbage and Recycling in History (3 Credits)
What counts as valuable and what counts as trash? Who gets to decide? Who produces trash and who picks it up? By answering these questions, students will explore how humans have produced, dealt with, and ignored trash and recycling in the 19th and 20th century in both urban and rural settings.
Credit Only Granted for: HIST403 or HIST428P.
Formerly: HIST428P.

HIST405 Environmental History (3 Credits)
An introduction to the key issues and methods of environmental history. The scope of the subject is discussed, as well as its relationship with other disciplines, such as ecology, anthropology, and geography. A primary focus is environmental change in history with emphasis on the American experience.

HIST406 History of Technology (3 Credits)
The changing character of technology in modern history, beginning with the Middle Ages. Concentrates on the Industrial Revolution and its aftermath, the nature of technological knowledge and the sources of technological change.

HIST407 Technology and Inequality (3 Credits)
How are social inequality and technology related? Have technologies exacerbated social tensions or have they ameliorated them? In the age of climate change, pandemics, and economic transformations, this class looks at technology in history to examine previous transitions in production, infrastructures, computing, and pollution. The emphasis is on the interplay between society and technology in the 19th and 20th centuries.

HIST408 Senior Seminar (3 Credits)
A capstone course for history majors, designed to increase historical knowledge and the ability to analyze texts and arguments. Topics will focus on the literature of a particular field and primary-source research.
Restriction: Must be in History program.
Repeatable to: 6 credits if content differs.

HIST412 History of Women and Gender in Africa (3 Credits)
An examination of socio-economic and cultural change in Africa from the dawn of the colonial era in the 19th century to independence in the mid-twentieth century. Major focus on how African women understood and responded to the expansion of European empires, changes in the colonial economy, and impact of westernization and urbanization.
Credit Only Granted for: HIST412 or HIST428L.
Formerly: HIST428L.

HIST415 Ideas and Politics in Europe Since 1900 (3 Credits)
Examination of intersection of ideas and politics in Europe since 1900. Focus will be on advocates of liberalism, social democracy, fascism, Nazism, communism, and conservatism and their impact on politics and policy since 1900.

HIST416 History of Slavery and the Slave Trade in Africa (3 Credits)
Examines the history and impact of the slave trade on African states, societies, and economies. Investigates the meaning of slavery in Africa, the local uses of slavery there and Africa's connections to the Trans-Saharan, Red Sea, and Trans-Atlantic slave trades.
Credit Only Granted for: HIST416 or HIST419Y.
Formerly: HIST419Y.

HIST417 Colonial Encounters: Natives, Spaniards, and Africans in the New World (3 Credits)
An exploration of the discourses and practices of the Spanish colonial project in the New World and the ways in which Indians and Blacks were incorporated into or excluded from that project. Also examines native and African resistance and adaptation to Spanish rule, and the process of transformation and hybridization of Spanish, native and African cultures in Spanish America. An analysis of recent historiographical developments that have profoundly changed the understanding of the Spanish conquest and colonization of the New World.
Recommended: HIST220 and HIST250.
Credit Only Granted for: HIST417 or HIST428Y.
Formerly: HIST428Y.

HIST418 Jews and Judaism: Selected Historical Topics (3 Credits)
Prerequisite: HIST281, HIST283, HIST106, HIST286, or HIST282; or permission of instructor.
Repeatable to: 6 credits if content differs.

HIST419 Special Topics in History (3 Credits)
Repeatable to: 9 credits if content differs.

HIST419Q Before the Holocaust: The Golden Age of Eastern European Jewry (3 Credits)
An exploration of the history of the Jews of Eastern Europe from the period of the Polish Lithuanian Commonwealth until the Holocaust. Topics to be covered include religious, political, social, and cultural transformation of Jewish life in Eastern Europe in the context of the general political changes in the area.
Cross-listed with: JWST370.
Credit Only Granted for: JWST419E, JWST370, or HIST419Q.
Formerly: JWST419E.

HIST421 Medieval Heresies (3 Credits)
An examination of twelfth- and thirteenth-century heresies in the medieval West. Consideration of why so many heretics emerged, and how the church attempted to deal with them, and what effect their persecution had on Europe both then and later. Special attention given to groups that stood on the fine line between heresy and orthodox religion.
Credit Only Granted for: HIST408L or HIST421.
Formerly: HIST408L.

HIST425 Imperial Russia (3 Credits)
The rise and fall of the Russian Empire, Peter the Great to the collapse of tsarism in revolution. Emphasis on the evolution of autocracy, social groups, national identities, and cultural change.

HIST428 Selected Topics in History (3 Credits)
Repeatable to: 9 credits.

HIST429 Special Topics in History (3 Credits)
Repeatable to: 9 credits.

HIST429X Tradition and Change: Jewish Religion in the Modern World (3 Credits)
An exploration of the history of the different modern Jewish religious movements that developed in Europe, starting with messianic movements and ending with Reform and Orthodoxy. Emphasis will be placed on the influence of the academic study of Judaism on the development of modern Jewish religious ideologies and practices.
Cross-listed with: JWST347, RELS347.
Credit Only Granted for: RELS347, JWST347, HIST429X, or RELS419R.
Formerly: RELS419R.

HIST430 Reformations in Politics, Religion, and Gender: England 1485-1603 (3 Credits)
An examination of the political, religious, and social forces in English life, 1485-1603, with special emphasis on Tudor government, the English reformation, and the Elizabethan era.

HIST431 Becoming Great Britain, 1603-1704 (3 Credits)
An examination of the political, religious, and social forces in English life, 1603-1714, with special emphasis on Puritanism and the English revolutions.

HIST434 Victoria's Secrets: Sex and Class in Nineteenth Century Britain (3 Credits)
Queen Victoria, Jack the Ripper, Sherlock Holmes, Oscar Wilde, and Charles Darwin--all of them were "Victorians" yet just what did that word mean and what values did it encompass? This course will examine the social and cultural life of Great Britain from 1830 to 1900, and encompass the worlds of the elite upper classes to the slums of London's East End. We will pay particular attention to the various meanings of Victorianism and the myths and practices of progress, morality, reform, and imperial conquest that defined the era. We will focus on the "Two Nations" residing within Britain and how government and moral reformers addressed conditions of social inequality, poverty, and crime. Victorian medicine and science and their intersection with empire will be covered. We will also address Victorian notions of class, race, gender, and sexuality and how they were shaped by and influenced the politics and culture of everyday life.
Credit Only Granted for: HIST419A or HIST434.
Formerly: HIST419A.

HIST436 Napoleon, the French Revolution and the World (3 Credits)
An argument for the broad continuity between the revolutionary and Napoleonic wars.

HIST437 Modern France from Napoleon to DeGaulle (3 Credits)
The changing political and cultural values of French society in response to recurrent crises throughout the 19th and 20th centuries. Students should have had some previous survey of either Western civilization or European history.

HIST441 Germany Since 1900 (3 Credits)
Course places Nazism in context of German and European history. Topics include collapse of German democracy and the establishment of the Nazi dictatorship; the role of Hitler; the response of political, military, economic, diplomatic, legal, media, theological elites and the broader population; the mix of terror, consent and coercion; propaganda and Nazi culture; contours of Nazi racial ideology and anti-Semitism and their impact on domestic and foreign racial policy; the economic history of the Nazi regime; foreign policy from rearmament to launching World War II to expansion and defeat; Jewish policy from the years of persecution to those of extermination; Nazi policy in Eastern and Western Europe, towards the United States, and towards North Africa and the Middle East; why the Allies won World War II and why and how Nazi Germany was defeated; the nature of the Allied occupation after 1945; the Nuremberg war crime trials; aftermath of facing and avoiding the crimes of the Nazi regime in West and East Germany.

HIST442 Twentieth-Century Russia (3 Credits)
Russia and the Soviet Union from the fall of the tsars to the post-communist present. Impact of Leninism, Stalinism, and Soviet Communism on state, society, culture, and nationality.

HIST444 America in the 1960s (3 Credits)
Celebrated and vilified, the years between 1960 and 1970 represented a watershed in twentieth-century American history. Although history rarely falls neatly within 10-year divisions, the 1960s - as both historical era and historical idea - witnessed enormous political, social, and cultural changes. This course will examine the seminal events, actors, and movements that continue to shape our nation.
Credit Only Granted for: HIST319V or HIST444.
Formerly: HIST319V.

HIST450 American Capitalism: 1600-1900 (3 Credits)
This course explores the transformation of economic life in what became the United States from pre-colonial times to 1900, with special emphasis on economic interactions among Native American, Mexican, and European societies; how and why capitalism took root and became dominant; economic dimensions of the Revolutionary and Civil Wars; why the North, South, and West followed distinct economic paths; the revolutions in transportation and communications; slavery as a business system; causes and consequences of industrialization; and trends in the distribution of wealth and income.

HIST451 American Capitalism: 1900 to Present (3 Credits)
An examination of the evolution of American capitalism from 1900 to the present, with special attention on the emergence of the United States as the world's leading economic power; the impact of big business on work and government regulation; causes and consequences of the Great Depression; the role of business in the two world wars; postwar growth followed by the decline of U.S. global competitiveness; why consumerism occupied a central role in U.S. history; the influence of economic theory on policymaking; realities and mythologies of Reaganomics and Clintonomics; and the economic impact of the digital revolution.

HIST452 Diplomatic History of the United States to 1914 (3 Credits)
American foreign relations from the American Revolution to the beginning of World War I. International developments and domestic influences that contributed to American expansion in world affairs. Analyses of significant individuals active in American diplomacy and foreign policy.

HIST453 Diplomatic History of the United States from 1914 (3 Credits)
American foreign relations in the 20th century. World War I, the Great Depression, World War II, the Cold War, the Korean War, and Vietnam. A continuation of HIST452.

HIST454 Constitutional History of the United States: From Colonial Origins to 1865 (3 Credits)
The interaction of government, law, and politics in the constitutional system. The nature and purpose of constitutions and constitutionalism; the relationship between the constitution and social forces and influences, the way in which constitutional principles, rules, ideas, and institutions affect events and are in turn affected by events. The origins of American politics and constitutionalism through the Constitutional Convention of 1787. Major constitutional problems such as the origins of judicial review, democratization of government, slavery in the territories, secession, and civil war.

HIST455 Constitutional History of the United States: Since 1865 (3 Credits)
American public law and government, with emphasis on the interaction of government, law, and politics, and the relationship between the constitution and social forces and influences, the way in which constitutional principles, rules, ideas, and institutions affect events and are in turn affected by events. Major crises in American government and politics such as Reconstruction,the rise of corporate power, civil liberties during wartime, the New Deal era, the civil disorders of the 1960s.

HIST459 Society in America: Historical Topics (3 Credits)
A consideration of selected aspects of American society from colonial times to the present. Special emphasis on regionalism, immigration, nativism, minorities, urbanization, and social responses to technological changes.
Repeatable to: 6 credits if content differs.

HIST460 History of Labor in the United States (3 Credits)
The American working class in terms of its composition; its myths and utopias; its social conditions; and its impact on American institutions.

HIST462 Slavery, Sectionalism, and the U.S. Civil War (3 Credits)
Slavery, sectionalism, and the coming of the Civil War. Resources and strategy of the Confederacy and the Union, the war's changing character, emancipation and its consequences, conditions on the home front, and the wartime origins of Reconstruction.

HIST465 Oral History of Immigration (3 Credits)
Uses oral history to explore experiences of migrants to the Washington, D.C. area since the mid-twentieth century in projects based on engagement with local immigrants.
Credit Only Granted for: HIST428M or HIST465.
Formerly: HIST428M.

HIST466 Immigration and Ethnicity in the U.S. (3 Credits)
Seminar exploring historical problems relating to US immigration, race, and ethnicity since 1848, with emphasis on cultural impacts of migration on immigrants, their children, and U.S. society.
Credit Only Granted for: AAST498L or HIST466.

HIST467 Women and Reform Movements in the Twentieth-Century United States (3 Credits)
Investigation of women's participation in such twentieth-century reform movements as the labor movement, the struggle for racial justice, social welfare reform, and women's movements. Will ask how race, class, and gender were implicated in the ways that women agitated for social political change.
Recommended: HIST201, HIST211, or HIST255.
Credit Only Granted for: HIST467 or HIST429E.
Formerly: HIST429E.

HIST469 Study Abroad Special Topics IV (1-6 Credits)
Special topics course taken as part of an approved study abroad program.
Repeatable to: 15 credits if content differs.

HIST470 Corporations on Trial (3 Credits)
Examines legal challenges to corporations around the world over the past 200 years through selected case studies. Topics include globalization, empires, the world wars, and the emergence of human rights, corporate social responsibility, and environmental justice.
Credit Only Granted for: HIST419X or HIST470.
Formerly: HIST419X.

HIST473 History of the Caribbean (3 Credits)
Offers a concise introduction to the history of the Caribbean regions from the Columbian voyages to the 20th century. Special emphasis is given to the dynamics of local social and cultural formations within the framework of the political and economic history of the Atlantic world.

HIST476 Jews in Medieval Times 1000-1450 (3 Credits)
Social and cultural life of Jewish communities spread throughout Islam and Christendom. Major topics include the Gaonate, kehila organizations, legal, rationalist, and mystical thought, and the context of rising animosity against Jews linked to the Crusades and changing Church doctrines.
Recommended: HIST282, HIST330, HIST331, or JWST234.
Cross-listed with: JWST432.
Credit Only Granted for: HIST476 or JWST432.

HIST481 A History of Modern China (3 Credits)
Modern China from 1644 to the People's Republic of China. Emphasis on the coming of the West to China and the various stages of the Chinese reaction.

HIST482 History of Japan to 1800 (3 Credits)
Traditional Japanese civilization from the age of Shinto mythology and introduction of continental learning down to the rule of military families, the transition to a money economy, and the creation of a townsmen's culture. A survey of political, economic, religious, and cultural history.

HIST483 History of Japan Since 1800 (3 Credits)
Japan's renewed contact with the Western world and emergence as a modern state, industrial society, and world power, 1800-1931; and Japan's road to war, occupation, and recovery, 1931 to the present.

HIST490 Seven Revolutions in Modern Africa (1945-) (3 Credits)
Seven Revolutions samples theoretical, contemporaneously produced, and leading scholarly (secondary) texts about seven revolutionary situations faced by Africans from ca. 1952 through to the 21st century. In past years we have devoted weeks or double weeks to the Mau Mau (Kenya), Ethiopian derg, Zimbabwe's factions and structural racism, Guinea and women's subalternity, Patrice Lumumba's assassination, race vs. settler as a framework, Liberia's intersection with continental history in the 1980s, among other focuses.
Credit Only Granted for: HIST428B or HIST490.
Formerly: HIST428B.

HIST491 History of the Ottoman Empire (3 Credits)
Survey of the Ottoman Turkish Empire from 1300 A.D. to its collapse during World War I. Emphasis on the empire's social and political institutions and its expansion into Europe, the Arab East and North Africa.

HIST492 Women and Society in the Middle East (3 Credits)
Examines the customs, values and institutions that have shaped women's experience in the Middle East in the past and in the contemporary Middle East.
Recommended: Prior coursework in Middle East studies or gender studies.
Cross-listed with: WGSS456.
Credit Only Granted for: HIST492, WMST456 or WGSS456.
Formerly: WMST456.

HIST495 Women in Medieval Culture and Society (3 Credits)
Medieval women's identity and cultural roles: the condition, rank and rights of medieval women; their access to power; a study of women's writings and the constraints of social constructs upon the female authorial voice; and contemporary assumptions about women.
Cross-listed with: WGSS455.
Credit Only Granted for: HIST495, WMST455 or WGSS455.
Formerly: WMST455.

HIST499 Independent Study (1-3 Credits)
Restriction: Permission of ARHU-History department.
Repeatable to: 6 credits.

HISX - History Education Abroad

HISX200 World of the Vikings (3 Credits)
The history and worldview of pre-Christian Scandinavians as reflected in medieval textual sources and in poems and artifacts from the Viking Age (793--1066 CE). We examine Norse society, political structures, gender ideals, religion and mythology. You learn about Viking expansion, colonies and conquests. An essential part of this interdisciplinary course is dedicated to medieval Icelandic sagas and how Vikings are portrayed in modern public history and contemporary popular culture.
Additional Information: This course is offered as part of the Maryland-in-Stockholm study abroad program. Students must apply for this program through Education Abroad: More information at ter.ps/UMStockholm. Education Abroad processes registrations for this course on behalf of students.

HISX205 Rome: Republic and Empire (3 Credits)
Explores the Roman Republic and Empire, from the development of Italic culture in the Bronze Age through the dissolution of the empire in late antiquity. Via primary sources, students examine the development of political forms and ideas in the Mediterranean and their impact on Rome, the relationship of art and literature to society and politics, and developments in the areas of religion, science, and the economy.
Credit Only Granted for: HISX205 or HIST269Y.
Formerly: HIST269Y.
Additional Information: This course is offered as part of the Maryland-in-Rome study abroad program. Students must apply for this program through Education Abroad: More information at ter.ps/UMRome. Education Abroad processes registrations for this course on behalf of students.

HISX206 Mediterranean Culture and History (3 Credits)
Offers a broad introduction to the main stages of evolution of the Mediterranean using as a framework, not History, but its cultures, religions and peoples. The main topics covered are: Judaism, Christianity, Islam, Greece, Rome, Germanics, Byzantines, the Atlantic and the Mediterranean, the Renaissance, the Mediterranean family and the Modernization of Mediterranean Societies.
Additional Information: This course is offered as part of the Maryland-in-Barcelona study abroad program. Students must apply for this program through Education Abroad: More information at ter.ps/UMBarcelona. Education Abroad processes registrations for this course on behalf of students.

HISX207 Roman Civilization and Daily Life (3 Credits)
Explores the daily life of the Roman people including daily habits, duties, pleasures, family life, and belief and value systems. Students will examine remnants of society left at Pompeii to learn about everyday life, and ultimately death, in the context of the ancient Roman world and integrate archaeological, art historical, and primary literary material into a single, coherent intellectual narrative in order to gain a complex understanding of Roman Civilization at its height.
Additional Information: This course is offered as part of the Maryland-in-Perugia study abroad program. Students must apply for this program through Education Abroad: More information at ter.ps/UMPerugia. Education Abroad processes registrations for this course on behalf of students.

HISX300 Scandinavia in the Middle Ages: from Viking Warriors to Christian Knights (3 Credits)
Focuses on the development of Denmark, Norway, and Sweden as kingdoms in the Middle Ages, both in terms of internal relations and contact, conflict, and exchanges with continental Europe and the wider world. We examine state building and law-making, Christianization and church organization, feuds, rebellions, and warfare, the Baltic crusades and forced conversion of pagans, literary and cultural developments, as well as migration and border-crossing. The aim of the course is to consider these phenomena in the intersection between cultural adaptation and domestic creativity; to what extent does Scandinavia adapt to wider European trends, and to what extent are they independently formed?
Additional Information: This course is offered as part of the Maryland-in-Stockholm study abroad program. Students must apply for this program through Education Abroad: More information at ter.ps/UMStockholm. Education Abroad processes registrations for this course on behalf of students.

HISX301 History of Sweden in Europe and the World (3 Credits)
Sweden's historical relationships to the Baltic Region, Europe and the US. We will look at the Great Power Era, the poverty and mass emigration of the 19th century, the internationally famous inter-war Middle Way; we will then consider Sweden's role in World War II and the Cold War, as well as the current impact of neoliberalism and globalization. Our focus, throughout, will be on Sweden's international profile and power, and the influence of this, in turn, on Sweden's national identity and future.
Additional Information: This course is offered as part of the Maryland-in-Stockholm study abroad program. Students must apply for this program through Education Abroad: More information at ter.ps/UMStockholm. Education Abroad processes registrations for this course on behalf of students.

HISX302 Barcelona: the City and its History (3 Credits)
This is a course that emphasizes the historical development of Barcelona from Pre-Roman times until nowadays. Although this course has a dominant historical approximation, other disciplines will be also taken into account, such as art, literature, architecture and urbanism.
Additional Information: This course is offered as part of the Maryland-in-Barcelona study abroad program. Students must apply for this program through Education Abroad: More information at ter.ps/UMBarcelona. Education Abroad processes registrations for this course on behalf of students.

HISX311 The History & Culture of Italian Food (3 Credits)
Examines the relationship between food, culture and identity in Italy through a variety of readings, discussions, outdoor activities and tasting experiences. Traces the historical evolution of Italian food culture through a multi-disciplinary (historical, anthropological, sociological, geographical) approach, using food workshops to supplement lectures and class discussions.
Additional Information: This course is offered as part of the Maryland-in-Florence study abroad program. Students must apply for this program through Education Abroad: More information at ter.ps/UMFlorence. Education Abroad processes registrations for this course on behalf of students.

HISX317 Medicine and Disease Before Biomedicine (3 Credits)
Explores the origins of medicine as we understand it today with topics such as the consequences of the Black Death and if Western medicine is truly all-Western. Focuses on four themes from Antiquity through the Scientific Revolution and the transformation of theory, changes in practice, birth of medical institutions, and global transfers of knowledge.
Additional Information: This course is offered as part of the Maryland-in-Florence study abroad program. Students must apply for this program through Education Abroad: More information at ter.ps/UMFlorence. Education Abroad processes registrations for this course on behalf of students.

HLSA - Health Services Administration

HLSA300 Introduction to Health Policy and Services (3 Credits)
A multidimensional view of public health policy and services. Through interactive discussion of assigned readings, team-based learning, and supplementary lecture, students will learn about the nature of and development of policy, public health policy, and financing and delivery of health care services. This course will place a significant emphasis on a team-based learning approach to understanding the health care system and health care reform.
Prerequisite: Must have completed or be concurrently enrolled in SPHL100 or PHSC300.
Restriction: Must be in Public Health Science program; and must have earned a minimum of 60 credits.
Credit Only Granted for: SPHL498P or HLSA300.
Formerly: SPHL498P.

HLSA320 Comparative Global Health Care Delivery Systems (3 Credits)
Compare global health care delivery systems with special emphasis upon relationships among the complex systems impacting human health. Students will engage in project-based learning about the impact of human service systems on a global scale exploring how corporations, multilateral aid, philanthropies, foundations, and private donors affect health and interventions.
Recommended: C- or higher in GBHL200 and SPHL100.
Restriction: Must have earned a minimum of 60 credits.

HLSA465 Redesigning Mental Health Services (3 Credits)
Students will use Design Thinking to create, reshape, redesign and transform the ways in which mental health and wellness is perceived and addressed on the campus. This course will incorporate students and the UMD community as stakeholders in designing, planning and contributing to developing solutions that leverage existing mental health resources or create new pathways to improve mental health and wellness at UMD. Students will learn and use design thinking skills to enhance public health practice skills in project proposals and grant writing.
Prerequisite: HLTH366.
Recommended: EPIB301.

HLSA484 Redesigning Health Care: Developing a Clinic to Meet Community Needs (3 Credits)
Provides an opportunity for students to learn a key entrepreneurial skill, Human Centered Design Thinking, while helping to build, reshape, redesign and transform delivery of health care in the Mona Center, a new community center and clinic in Prince George's County. This new, modern vision for a health and wellness clinic embraces student involvement in designing, planning and contributing to innovative programs, solutions, and processes to improve the clinic's ability to meet community and patient needs by addressing the social determinants of health as well as traditional clinical health status. Students in the class will develop empathy for patients, providers and other stakeholders, define problems, select a specific problem for intervention, understand problems based on stakeholder input, ideate, reframe and suggest options to solve or address the problem, prototype solutions, test ideas, and make recommendations to inform implementation and ongoing measurement and monitoring of impact.
Restriction: Must have completed a minimum of 60 credits.
Additional Information: Selected class sessions will be on-site at local organizations such as Mona Clinic in Temple Hills, MD, HAIR Network shops in Hyattsville and the Sarvis Empowerment Cafe in Riverdale. The course also requires off-campus work at nearby locations.

HLSC - Integrated Life Sciences

HLSC100 Students in the University: Integrated Life Sciences (1 Credit)
In a small classroom setting, Integrated Life Sciences students learn about academic resources on and off campus.
Restriction: Must be in the Honors College Integrated Life Sciences program.
Credit Only Granted for: EDCP108O, HLSC100, HONR100, or UNIV100H.

HLSC102 Service-Learning in the Life Sciences (1 Credit)
The Integrated Life Sciences (ILS) Honors Program includes a rigorous academic curriculum, a research requirement, a living-learning component, and a service-learning experience. Service has been a tradition since 2012 and was initiated by our students, who wanted service incorporated as part of the ILS mission and values. Our students have contributed more than 6,000 hours of their time and talent to campus and local organizations, and this experiential learning has provided an opportunity to apply classroom studies to the real world. In general, these service experiences are directly relevant to their future careers as life scientists, because they contribute to improved access for all people to quality health care, to engaging STEM education, and/or to sustainable environments. The service-learning experience is introduced in the fall semester of the first year of ILS in HLSC100, and completed with a 1-credit course in the spring.
Prerequisite: HLSC100.
Restriction: Must be in the Honors College Integrated Life Sciences program.

HLSC207 Principles of Biology III Organismal Biology (3 Credits)
The diversity, structure and function of organisms as understood from the perspective of their common physicochemical principles and unique evolutionary histories.
Prerequisite: BSCI160, BSCI161, BSCI170, and BSCI171; Or students who have taken courses with comparable content may contact the department.
Restriction: Must be in the Honors College Integrated Life Sciences program.
Credit Only Granted for: BSCI207, BSCI279D, or HLSC207.

HLSC217 The British Masters of Science (3 Credits)
The British Masters of Science will look at the British Scientists who have been at the forefront of some of history's greatest advances and have shaped science as we know it today. This London study abroad program will explore these scientific masters in the city where they made their great contributions, visiting the places where they lived and worked to experience the historic foundations of science.
Restriction: Must be in the Integrated Life Sciences Honors Program.

HLSC227 Topics in Scientific Integrity and Medical Ethics (1 Credit)
Explores ethical issues related to scientific research and integrity as well as issues surrounding medical ethics such as use of limited resources, euthanasia, and physician-assisted suicide. This is a topics class, so we won't be going into detail of philosophical arguments, but we may bring them up as relevant. Moreover, especially as applied to medical ethics, there may be no "right" answer. Instead, we would like you to be able to think critically about the issue, and make a moral argument (as opposed to a logistical argument).
Restriction: Must be in a major in UGST-HCOL-Integrated Life Sciences Program.

HLSC242 Global Issues, Local Approaches: Colonialism, Public Health, and Climate Change in Puerto Rico (3 Credits)
Students will explore the intersections of culture, politics, and climate change in Puerto Rico's Caribbean archipelago and how local actors and community-led movements address these challenges. Through lectures, site visits, and hands-on service projects, students will focus on Puerto Rico as a case study to explore local approaches to critically claim more vital institutions, promote sustainable practices, and implement climate action solutions. The program will highlight the island's activism by engaging with local scholars, community leaders, and organizations tackling issues such as climate change, disaster recovery, renewable energy, and public health inequities. By critically analyzing these themes and participating in collaborative service projects, students will gain a multidisciplinary understanding of Puerto Rico's past and present while reflecting on global sustainability and social justice issues.
Cross-listed with: SPAN269R.
Credit Only Granted for: HLSC242 or SPAN269R.
Additional Information: This is an Education Abroad course.

HLSC280 Integrative and Quantitative Concepts in Biology (3 Credits)
Designed for entering students enrolled in the Honors College Integrated Life Sciences (ILS) program, this course uses an active learning approach to emphasize inquiry, critical thinking, quantitative reasoning, and hands-on data analysis. This course will cover a variety of bioinformatic related topics, including genome assembly and scaffolding, sequence alignment algorithms, epigenetics, a bioinformatic examination of the central dogma in molecular biology, gene finding, proteomic analysis, the evolution of molecules, cells and organisms, molecular switches, and biological networks.
Prerequisite: BSCI170.
Restriction: Must be in the Honors College Integrated Life Sciences program.
Credit Only Granted for: HLSC208 or HLSC280.
Formerly: HLSC208.

HLSC322 Principles of Genetics and Genomics (4 Credits)
Principles and mechanisms of heredity and gene expression, with a focus on the application of genomics to contemporary medicine, biotechnology, and societal issues.
Prerequisite: CHEM131, CHEM132, BSCI160, BSCI161, BSCI170, and BSCI171; or must have completed BSCI170, BSCI171 and two semesters of Chemistry.
Restriction: Must be in a major in UGST-HCOL-Integrated Life Sciences Program.
Credit Only Granted for: HLSC322 or BSCI222.

HLSC329 Teaching Practicum in the Life Sciences (1 Credit)
A guide and support for the undergraduate teaching assistants (UTAs) in the Integrated Life Sciences (ILS) honors living-learning program. UTAs will develop a greater understanding of teaching and learning in the life sciences, with a focus on the academic values of ILS, by exploring education research and theory, discussing learning strategies and techniques, and reflecting on their practice. Students take this course while serving as a undergraduate teaching assistant in the Integrated Life Sciences courses.
Restriction: By departmental permission only.
Repeatable to: 3 credits.

HLSC374 Mathematical Modeling in Biology (4 Credits)
Students will learn empowering mathematical techniques through the understanding of biological models. Models are chosen from a variety of biological disciplines. Mathematical skills that will be developed along the way include: solving non-linear difference equations, eigenvector analysis, and the implementation of these algorithms as computer models.
Prerequisite: MATH131, MATH136, or MATH141.
Cross-listed with: BSCI374.
Credit Only Granted for: BSCI374, BSCI474, or HLSC374.
Formerly: BSCI474.
Additional Information: The HLSC374 version of this course is restricted to students in the Honors College Integrated Life Sciences program.

HLTH - Health

HLTH106 Drug Use and Abuse (3 Credits)
An interdisciplinary analysis of contemporary drug issues and problems. The course will examine physiological, psychological, social, philosophical, historical, legal and health aspects of drug use and abuse. Special attention will be focused on those general motivations for drug use that attend life on the college campus.

HLTH124 Introduction to Behavioral and Community Health (1 Credit)
Required of first semester Community Health majors to expose them to introductory-level concepts within the field of behavioral and community health as well as the Community Health degree program. Includes discussion on the delivery of behavioral and community health at the local, state, national, and global levels; career opportunities in the diverse sectors of the community health field; undergraduate programmatic information; and strategies for student success.
Restriction: Must be in a major within the SPHL-Behavioral & Community Health department.

HLTH140 Personal and Community Health (3 Credits)
Meaning and significance of physical, mental and social health as related to the individual and to society; important phases of national health problems; constructive methods of promoting health of the individual and the community.

HLTH170 The Corporate Footprint: How Industries Influence the Public's Health (3 Credits)
As public health advocates strive to protect, promote and advance the health of our communities, they sometimes find their efforts in conflict with the activities of corporations and their industry associations. This course will provide an overview of how various industries from Big Pharma to Tobacco Corporations have launched successful campaigns to influence policymakers, counter science and at times mislead the public on the harms of products to the health of communities. Students will also contemplate whether the relationship between corporations and public health advocates can ever be collaborative rather than contentious.

HLTH200 Introduction to Research in Community Health (3 Credits)
An overview of specific components and steps involved in the community health research process. Content includes, foundations of research, sampling, measurement design, and analysis in a community context.
Restriction: Must be in a major within the SPHL-Behavioral and Community Health department; or enrolled in the Social Data Science Public Health Track .

HLTH212 Unraveling the Human Body: Anatomy and Physiology from a Public Health Perspective (4 Credits)
Focuses on human structure and function and provides a foundation for public health professionals by equipping them with an integrated understanding of the dynamic human body, its various biological processes, and associated diseases. The course begins at the simplest level of cellular organization and progresses to tissues, organs, and organ systems. Specific body systems covered include Cardiovascular, Respiratory, Endocrine, Nervous, Digestive, Male and Female Reproductive, Musculoskeletal, Skeletal, and Immune. The complementary structure and function of the healthy body is highlighted as its systems work together to maintain a constant homeostatic environment. Clinical examples are provided to help the student understand the disease process as a disruption of normal structure and function. This will allow them to communicate to various audiences how disease functions within the human body as well as discuss lifestyle factors that are associated with disease onset and progression.
Prerequisite: BSCI170, BSCI171, and HLTH140.
Restriction: Must be in the Public Health Practice program.
Credit Only Granted for: BSCI201 or HLTH212.

HLTH230 Introduction to Health Behavior (3 Credits)
Psychological, social psychological, and sociological approaches to the following health areas: development of health attitudes and behavior, patient-provider interaction and the organization of health care.

HLTH234 Global Health Messages: Understanding Exposure & Impact (3 Credits)
Using a global perspective, this course teaches students to be critical consumers of current and historical health communication interventions. It also provides students with the skills to develop media interventions that target specific and general populations. Students will discover the array of diverse media messages that influence the health and well-being of individuals and communities.
Restriction: Must not be in the Community Health program.

HLTH240 Am I Not a Man? Contemporary Issues in Black Men's Health (3 Credits)
Exposes students to the fundamental aspects of the lived experiences of Black men in the U.S. by critically examining social, economic, cultural, historical, and environmental factors that determine the health and well-being of this heterogenous population. Utilizing a life course perspective, students will assess the health status and health care needs of this population using a health equity lens by drawing upon foundational aspects in the field of public health including, the ecological approach, determinants of health, public heath critical race praxis, and the health disparities generation research framework. Current contemporary health issues will be applied to both highlight and provide evidence of the multitude of factors shaping the lives of Black men. Ultimately, the course aims to identify potential recommendations and solutions to support the well-being of this critically important community.
Prerequisite: Minimum grade of C- in HLTH 140; or permission of SPHL-Behavioral and Community Health.
Recommended: HLTH 200, HLTH 230, and FMSC 190.
Restriction: Must be in a major within SPHL-Behavioral & Community Health Department or enrolled in the Anti-Black Racism Minor.

HLTH246 The U.S. Tobacco Epidemic (3 Credits)
Tobacco is the leading cause of preventable death in the U.S. Course provides an overview of the tobacco epidemic including history, health effects, economic costs, policy, surveillance, and prevention, in addition to additional products like e-cigarettes, vaping and hookahs. .

HLTH264 Digital Health & Social Media (3 Credits)
Examines the current and potential use of digital health and social media to influence public health. Provides an overview of knowledge, skills and terminology necessary to optimize the effectiveness of these technologies to contribute to the enhancement of individual and community health.
Restriction: Must not be in the Public Health Practice program.

HLTH285 Controlling Stress and Tension (3 Credits)
Health problems related to stress and tension. Analysis of causative psychosocial stressors and intervening physiological mechanisms. Emphasis on prevention and control of stress through techniques such as biofeedback, meditation and neuromuscular relaxation.

HLTH289 Topical Investigations (1-3 Credits)
Independent study by an individual student or an experimental course in special areas of knowledge not covered by regularly scheduled courses.
Repeatable to: 6 credits if content differs.

HLTH292 Community Health Engagement (3 Credits)
An exploration and application of basic community health concepts. An integral part of the course is service learning, that includes evaluating, planning and implementing a community health program with a local community partner.
Restriction: Must not be in Public Health Practice program.

HLTH302 Methods of Community Health Assessment (3 Credits)
Examination of research and evaluation tools that can be applied to community health promotion. Includes the application of qualitative research methods, community needs and strengths assessments, asset mapping, and monitoring and evaluating process, outcome and impact evaluation.
Prerequisite: Minimum grade of C- in HLTH200 and EPIB301.
Restriction: Must be in a major within the SPHL-Behavioral and Community Health Department.

HLTH306 Macro Level Influences on Community Health (3 Credits)
An examination of the effects and influences of policy decisions at the local, state and national levels on community health delivery. Historical and contemporary policy issues will be included with a focus on how the policies have impacted community organizations and the overall health of communities.
Prerequisite: Minimum grade of C- in HLTH124.
Restriction: Must be in a major within the SPHL-Behavioral & Community Health department.

HLTH325 Poor in America: Health and Wellbeing (3 Credits)
Using the ecological framework, students will explore the complicated relationship between poverty and health and well-being in the United States.
Recommended: HLTH130; or HLTH140.

HLTH364 Social Media & Digital Tools for Community & Public Health (3 Credits)
Examination of the characteristics and uses of media platforms and digital technologies to expand the capability to identify and reduce community and public health risks at all levels of prevention. Also considered will be the potential threats these new media can play on individual choice, privacy, confidentiality, and social influence -- which themselves can pose health threats to community and public health.
Prerequisite: Completion of HLTH230 with a C- or higher.
Restriction: Must be in a major within the SPHL-Behavioral and Community Health department; Restricted to majors who entered the program in Fall 2018 or later.

HLTH366 Behavioral and Community Issues in Public Health (3 Credits)
The exploration of how social and behavioral science theories and public health concepts and methods can be applied to both the health-illness experience and community interventions.
Prerequisite: HLTH130, HLTH230, PSYC100, SOCY100, SOCY105, or ANTH260.
Restriction: Must be in Public Health Science program; or permission of SPHL-Behavioral & Community Health department. And must have earned a minimum of 45 credits.
Additional Information: This course will initially be restricted to Public Health Science (PHSC) majors, but could ultimately be opened to other majors, particularly those in HLTH.

HLTH371 Communicating Safety and Health (3 Credits)
The communication and evaluation of safety and health information. Emphasis on various types of communications and recipient factors which contribute to their success or failure.
Restriction: Must be in a major within SPHL-Behavioral & Community Health department.

HLTH377 Human Sexuality (3 Credits)
The biological and developmental aspects of human sexuality; the psychological and emotional aspects of sexual behavior; sexual identity; the historical, cultural, social, linguistic, legal and moral forces affecting sexual issues; the importance of communication, disclosure and intimacy in interpersonal relationships; and research trends in the area of human sexuality.

HLTH386 Experiential Learning (3-6 Credits)
Prerequisite: Permission of SPHL-Behavioral & Community Health department.
Restriction: Junior standing or higher.

HLTH389 Independent Study in Public Health Practice (1-6 Credits)
Independent study by an individual student.
Repeatable to: 6 credits if content differs.

HLTH391 Making a Difference: Applying Community Health (3 Credits)
The exploration and application of community health concepts including theoretical models, advocacy, cultural competency, asset mapping, and needs assessment. Includes planning, implementing and evaluating a community health program with a designated community partner.
Prerequisite: SPHL100, HLTH124, HLTH140, HLTH200, HLTH230, EPIB301, EPIB315, BSCI170, BSCI201, and HLTH302. Students must have completed or be concurrently enrolled in HLTH364.
Corequisite: HLTH490.
Restriction: Must be in a major within the SPHL-Behavioral and Community Health department.

HLTH399 Community Health Field Work (1-6 Credits)
Students will gain practical experience under conditions conducive to educational and professional development. The internship is a supervised period of community/public health activities, carried out in a relevant professional organization, that emphasizes the application of theory and previous coursework.
Prerequisite: Minimum grade of C- in HLTH124, HLTH140, and SPHL100.
Restriction: Must be in Community Health program; and must have earned a minimum of 45 credits.
Repeatable to: 6 credits if content differs.
Additional Information: Students will have the opportunity to be matched with regular DBCH partners who have requested an intern for the designated semester. Most field work experiences will be off-campus.

HLTH402 Disability is Not an Outcome: An Introduction to Understanding Disability (3 Credits)
With an intent to disrupt traditional understandings of disability as a health outcome to be prevented, this course will introduce students to disability as an identity, a community, a population of interest to public health professionals. To change this understanding students will explore historical representations of disability, ableism, and lived experiences of people with disabilities. Disability is a multi-layered concept that broadly describes a wide range of people. Although geared toward public health scholars, the mix of readings, discussions, and assignments will help students reflect and integrate learning into their own fields of study. The course examines factors that led to systemic oppression, and methods and strategies of moving toward a more inclusive society.

HLTH410 Honors Seminar (3 Credits)
Undergraduate majors with a strong academic record are provided the opportunity to engage in challenging educational experiences related to the social and behavioral aspects of public health. Students will learn the skills and knowledge to develop, propose, defend, and complete an honors thesis or honors project.
Prerequisite: HLTH200; and must have completed 2 other courses in HLTH.
Restriction: Minimum cumulative GPA of 3.5; and must have completed 45 credits before applying.

HLTH420 Effective Strategies for Public Health Practice (3 Credits)
The purpose of this course is to present the interrelationships of curriculum planning, methodology and the selection and use of successful public health presentation strategies. Special problems associated with public health presentations are discussed, and students become familiar with a variety of resources as well as with planning for and implementing demonstration presentations.
Prerequisite: Minimum grade of C- in HLTH140 and HLTH230; and must have completed with a minimum grade of C- or be concurrently enrolled in HLTH212.
Restriction: Must be in the Public Health Practice program.

HLTH424 Lesbian, Gay, Bisexual & Transgender Health (3 Credits)
The preparation of students to be knowledgeable advocates for the health of lesbian, gay, bisexual, and transgender (LGBT) populations. Course focus is defined by the Healthy People 2020 federal health objectives for LGBT populations: data collection for research, culturally competent healthcare, bullying in schools, suicide, homelessness, and sexually transmitted diseases including HIV.
Recommended: Students should have some familiarity with basic psychology, sociology and/or epidemiology.
Restriction: This course is restricted to students who have completed a minimum of 60 credits. Jointly offered with HLTH624.
Credit Only Granted for: HLTH424 or HLTH6 24.

HLTH430 Health Education in the Workplace (3 Credits)
A survey of the role of health education in work settings. Examination of occupational stress, the health effects of shift work, women's health in the workplace, health education approaches to informing workers and management, and health promotion programs in the workplace.

HLTH431 Health Literacy in Action (3 Credits)
This course introduces the concept of health literacy and develops the knowledge and skills to understand the field and engage productively about health literacy with healthcare providers, systems, and policy makers. The class explores diverse perspectives about health information and communication, and different pathways and strategies to help create the conditions for more informed and engaged individuals and communities.
Recommended: HLTH371; or equivalent.
Credit Only Granted for: HLTH431 or GBHL310 .

HLTH432 Medical Terminology (3 Credits)
Provides the framework for understanding medical language and terminology used by health care professionals. Students will gain an understanding of the rules of building and analyzing medical terms from word origins and will learn correct pronunciation, definitions, and spelling for all of the body systems, major pathological conditions, common disorders, prescribed medications, and more. Whether a student is interested in learning more about the medical field or they want to acquire practical knowledge for future personal use, this course provides the foundation for understanding the language of medicine.
Credit Only Granted for: HLTH432 or HLTH498T.
Formerly: HLTH498T.

HLTH434 Introduction to Public Health Informatics (3 Credits)
Provides an overview of the field of public health informatics and the influence of technology on the public's health and well-being. Emphasizes the application of various technologies and computer/internet applications to support public health research and practice, including strategies to address new and emerging threats.
Restriction: Must be in one of the following programs (Public Health Practice; Public Health Science) ; and must have earned a minimum of 60 credits.
Credit Only Granted for: HLTH434 or HLTH498E.
Formerly: HLTH498E.

HLTH452 Global Health and Social Justice (3 Credits)
Evaluates the relationship between social justice and population health through critical discourse analysis of social determinants of health and applications of community-based methods for reducing population health inequities within and across national borders. The class aims to stimulate students' critical analysis to identify, describe, measure and apply consequences of injustices in population ill-health exposures and practices (policies, interventions and services). Students will apply critical thinking about how social injustices create preventable health disparities, unequal social determinants, poor environmental exposures and diseases among vulnerable populations in much of low-income countries.
Jointly offered with: HLTH602.
Credit Only Granted for: HLTH452 or HLTH602.

HLTH460 Multicultural Population Health (3 Credits)
Health concerns of U.S. ethnic minority groups and factors placing them at elevated risk for disease and injury. Health education concepts and strategies to reduce disparities between their health status and the health status of the general population.
Prerequisite: HLTH140, HLTH230, or HLTH366; or permission of SPHL-Behavioral & Community Health department.
Restriction: Must be in a major within the SPHL-Behavioral & Community Health department; or must be in the Anti-Black Racism Minor.

HLTH471 Women's Health (3 Credits)
The women's health movement from the perspective of consumerism and feminism. The physician-patient relationship in the gynecological and other medical settings. The gynecological exam, gynecological problems, contraception, abortion, pregnancy, breast and cervical cancer and surgical procedures. Psychological aspects of gynecological concerns.
Cross-listed with: WGSS471.
Restriction: Must be in a program in the Harriet Tubman Department of Women, Gender, and Sexuality Studies; or must be in a major within SPHL-Behavioral & Community Health department.
Credit Only Granted for: HLTH471, WMST471, or WGSS471..
Formerly: WMST471.

HLTH489 Field Laboratory Projects (1-6 Credits)
A course designed to meet the needs of persons in the field with respect to workshop and research projects in special areas of knowledge not covered by regularly structured courses.
Repeatable to: 6 credits.

HLTH490 Professional Preparation in Community Health (3 Credits)
The development of skills necessary for joining the public health work force post-graduation, as well as assistance in obtaining an appropriate internship that will serve as a final semester, capstone experience. Students will be exposed to various relevant professional experiences, and will be afforded the opportunity to strengthen their own individual skills by selecting from a menu of skills-based learning modules that best suit their perceived needs.
Prerequisite: Minimum grade of C- in EPIB301, EPIB315, SPHL100, HLTH124, HLTH140, HLTH200, HLTH230, HLTH302, BSCI170, BSCI171, and BSCI201; and students must have completed or be concurrently enrolled in HLTH364.
Corequisite: HLTH391.
Restriction: Must be in a major within the Behavioral and Community Health department.

HLTH491 Community Health Internship (12 Credits)
Integrating theory with practice in a community health setting.
Prerequisite: Minimum grade of C- in HLTH 391 and HLTH490; all other program requirements must be completed.
Restriction: Must have completed all program requirements and be in the last semester of the Public Health Practice degree program.

HLTH492 BS/MPH Community Health Internship (9 Credits)
Integrating theory with practice in a community health setting.
Prerequisite: Minimum grade of C- in HLTH490.
Restriction: Must be a Public Health Practice major who has been admitted to the combined BS/MPH degree program.

HLTH498 Special Topics in Health (3 Credits)
Topics of special interest in areas not covered by regularly scheduled courses.
Repeatable to: 6 credits if content differs.

HNUH - University Honors

HNUH100 Gateway Seminar (1 Credit)
First-semester orientation and exploration seminar required of all UH students.

HNUH218A Pursuits of Happiness: Ordinary Lives in the American Revolution (3 Credits)
Dedicated to telling the stories of ordinary people in the American Revolution, to recovering the voices and experiences of all the founders of this country whose lives and contributions have been obscured by our tendency to worship a dozen or so well-to-do and well-educated men in suits as if they alone conceived and executed the American Revolution and the founding of the United States. So we'll be talking this semester about the marginalized, the downtrodden, the rank and file, the rabble - all the people who never make it onto monuments or money. The point of this is to allow us all to recognize the fundamental fact that fighting a Revolution is a collective act that requires a genuine mass movement. Declaring independence on a piece of parchment on a summer's day in Philadelphia in 1776 doesn't mean anything unless tens of thousands of people are willing to support that cause and fight to make it a reality. To revolt, then, is not an individual act - it's for crowds, for mobs, and for whole communities to do together. Declaring independence is a fundamentally cooperative act.
Credit Only Granted for: HNUH218A or HIST137.

HNUH218C Globalizing the American Revolution (3 Credits)
How is the American Revolution a creation story in the making of our multi-cultural and interconnected modern world? Consider the Declaration of Independence. When first published on July 5, 1776, it was printed by an immigrant Irishman on Dutch paper that had been brought over from England. This was the first such declaration of independence ever issued, but its ideas and forms traveled far and wide. More than 100 other declarations of independence have been issued since then. The people that declaration mobilized are similarly diverse: the American Revolution is as much the story of Creek farmers, Spanish soldiers, French slaves, Canadian fugitives, Indian tea-growers, and African statesmen as it is of the Minutemen and Sons of Liberty. In this globe-trotting class, students will be positioned to debate how the familiar story of the American Revolution changes when we place it in transnational context.
Cross-listed with: HIST223.
Credit Only Granted for: HNUH218C or HIST223.

HNUH218R Stealing from the Poor, Giving to the Rich: The Political Economy of Global Capitalism (3 Credits)
Street names and museum exhibits are being renamed in Europe to erase the ghosts of their colonial history. Yet, this speaks of the colonial "era" as the past, when in fact it is very much our present. The economic principle driving colonialism--capitalism--encouraged an insatiable appetite for territorial acquisition, human bondage, and destruction that stole wealth, life, and joy from racialized "others" to fuel European development. We maintain and further these thefts, oppressions, and exploitations through our purchasing habits and justify them through cultural ideas and ignorance. What would it mean to undo these oppressions? What must we understand to begin this process? This course surveys colonial capitalism and its legacies in Sub-Saharan Africa, the Americas, Asia, the Middle East, and North Africa to explore how history informs the present robbing of the Global South for the Global North's development, as well as pathways towards resistance and reconciliation.

HNUH218U Finding Feminist Freedom (3 Credits)
"I'm the one that'll make you pay." So goes one verse of what has become a Latin American feminist hymn, "Cancion sin miedo" ("Fearless Song," by Vivir Quintana). Transnationally, feminists today--particularly in the Global South--are on fire: militant, unafraid, angry, and, above all, driven by a desire to build a world where the promise of freedom for all is finally fulfilled. But what is freedom? Is freedom an abstract concept or a lived experience? Is it individual or collective? What is the meaning of 'feminist freedom'? These questions will be gauged by discussing, analyzing, and interpreting texts in feminist theory; decolonial and transnational feminist approaches; and feminist film, documentary, performance, and protest. At the end of the course, you will have learned that there is not one feminism, but many, become familiar with feminist theory and practice, and be equipped to live your own version of a feminist life.

HNUH218V Black Bodies and Green Spaces: From 1619 to Today (3 Credits)
From the antebellum plantation slave, who used uncultivated land as a place of deliverance, healing and route to freedom, to the Central Park bird watcher, whose green space presence was perceived as a threat to White physical safety, black bodies have a vexed relationship to green space. This course critically examines how systemic racism has shaped the experience, connection, and relationship to nature among Black Americans. Students will conduct in-depth analysis, critical thinking, and discussion on topics ranging from slavery and nature; The Great Migration; and Jim Crow, segregation, and parks; to green space inequity and "Moving While Black" (Treyvon to Ahmaud). While some environments (built, natural, virtual) within the United States have represented the essence of anti-Black racism and indignity, this course will further explore how many Black Americans still regarded nature as a space of freedom, humanity, and spirituality.

HNUH218W Freedom and Captivity: Prisons, Punishment, and Citizenship (3 Credits)
What does freedom mean if you're incarcerated? How is freedom, citizenship, and social membership mediated through the power of the state? What are the implications of punishment on how freedom is constructed, understood, and experienced? The United States purports to be a beacon of freedom while simultaneously incarcerating more people than any other country in the world. Throughout the course, we will discuss the writings of scholars, theorists, historians, and--most importantly--incarcerated people to interrogate the concept of "freedom" from the vantage point of the prison. Students will use these insights to analyze the complex tensions and relationships between social ideals and practice.

HNUH218X Uprising, Riot, Revolt: Violence in Story and Theory (3 Credits)
How does violence connect to revolution? Is violence the result of lone wolf actors, oppressive social structures, or just blind fate? Is it a side-effect of revolution or its driving force? Is violence a way to fight injustice, or is it a problem of evil? Why is one person's uprising another person's riot? In this seminar, we will explore literature, politics, and religion to debate the meaning and causes of violence. By examining the writings of a prison psychiatrist, historians, activists, theorists, and theologians alongside classic and contemporary literary works, we will disrupt common understandings of violence. In conducting interviews with community members, engaging in classroom debate, and sharing ideas in a project-poster session, we will investigate violence in the UMD community and wider DC area, and propose ways toward revolutionary change.

HNUH218Y The Science, Economics, and Governance of Climate Change: The Need For An Energy Revolution (3 Credits)
Hardly a day goes by without some newsworthy item being reported on Earth's changing climate. Often the stories are contradictory, tainted by parochialism and extremism, not only by the conservative and liberal media, but also by the camps of so-called believers and deniers. This seminar begins with a review of the history of how decisions regarding human interactions with the environment have either doomed past societies to failure or enabled long-term, sustainable success. That sets us up to examine the science of global warming, in a manner accessible to non-scientists, as well as the potential consequences of a rapidly changing climate, and the economics of large-scale renewable resources needed to avert climate catastrophe. During the final few weeks of this seminar, students will work in groups representing various parts of the world to negotiate an international plan to transition the world energy supply to renewable resources that emit little or no greenhouse gases.

HNUH218Z Soundtrack to Revolution: Black Protest Music from Slave Ship to Soundcloud (3 Credits)
Invites students to hear a tradition of black protest music that reverberates from the slave ship to Soundcloud and beyond. Together we will ponder how black people have created, performed, broadcast, and mobilized music for protest, self-making, community-building, cultural critique, agitation, venting, healing, and joy. To hear what protest music sounds like, we will listen to Paul Robeson, Mahalia Jackson, Billie Holiday, Abbey Lincoln and Max Roach, Nina Simone, Fela Kuti, Marvin Gaye, Aretha Franklin, Bob Marley, Michael Jackson, Public Enemy, NWA, Lil' Kim, Lauryn Hill, Beyonce, and others. Must protest music set overt political statements to melody? How have black people mobilized music and art to shape their political conditions? What can music accomplish that artforms like literature and visual art cannot? How have various social justice and liberation movements deployed music? How has new media technology transformed protest? How does revolution sound to you?

HNUH219P Transform Maryland: Management Consulting Internship (3 Credits)
This three-credit internship, open to all majors, offers a fully immersive consulting experience that affords undergraduate students the opportunity to engage with a real client. Working in dynamic teams, students learn advanced management consulting strategies, and apply critical thinking and solution design to real world cases, all while developing general professional acumen. The internship innovates real University of Maryland business processes. Managed by senior members of the DIT's Enterprise Planning and Continuous Improvement unit, the internship matches teams with top-tier professionals and a senior university administrator as a project client. Supported by professional coaching from practicing talent managers and management consultants, students research and benchmark against other schools, analyze and synthesize results, and formulate actionable recommendations for the client. The internship culminates in a recommendation pitch to campus leadership.

HNUH219T Transform Maryland: Consulting Practicum (3 Credits)
In this experiential learning opportunity, a team of students undertakes a real-world practicum to develop consulting skills and improve an operational process at the University of Maryland. A new project is selected each semester and the course culminates in a presentation to key members of the UMD leadership team. Through concepts drawn from multiple disciplines, students learn and apply an analytical, systems approach to problem solving. Working with oversight from experts in the industry, students partner with university officials to understand and map a business process that affects students, identify opportunities for process innovation, and apply user-centered design to develop a persuasive narrative to recommend solutions and leverage the potential for technology to streamline the process. This practicum prepares students to consult for real-world change, while practicing competencies they will use in their professional internship experience the following semester (HNUH219P).

HNUH228B Redesigning Life: Prospects and Consequences (3 Credits)
What is at stake for our world as humans seek to redesign biological organisms? Biotechnology advances are enabling us to read, edit and write genomes, including our own. This revolution has been fueled by the quest to understand and cure disease. Yet, these innovations have far-reaching consequences beyond medicine and will reshape our world in ways we can only imagine - or fear. The course will challenge students to confront the risks and rewards for them, their family, their community, and their future, as biotechnology moves out of specialized laboratories and into homes. A demystifying, low-tech approach will introduce them to contemporary genome redesign, clarifying the current limitations and future goals of the field. Students will debate whether redesigning plants and animals will enhance or inhibit momentum in human genome engineering, and formulate their own arguments about who should be able to use these tools and where, who decides, and how much society is willing to risk.

HNUH228C The Fiction of Fact: Race, Science and Storytelling (3 Credits)
What is a fact? Science is often viewed as an unbiased, fact-based, analytical discipline. However, throughout history, science has sometimes been the most potent weapon for creating and supporting political fictions and social hierarchies. Not unlike the discipline of the humanities, the sciences practice interpretation: scientists observe behaviors, of subject or objects, and necessarily provide an interpretation of the data. But it is the recourse to the "real" that has made science so powerful in underwriting cultural constructs. Whether we observe how science is manipulated in the public sphere, or how it is practiced for good or ill, it has been used to naturalize hierarchies of race, class or gender. Through a range of materials--fiction, film, visual arts, scientific articles, public humanities and political theses - this course will explore one of the most potent cases of this phenomenon of "scientific" storytelling: the case of race.

HNUH228R The Picture of Health and Illness: Modern Medicine in Illustration (3 Credits)
From prehistoric carvings, through King Tut's burial mask and Michelangelo's David, to the Lincoln Memorial and Body Worlds, images have long been used to communicate what people can and should be. After the "Scientific Revolution" in Europe, when identity was increasingly tied to biology, medical illustrations communicated theories of the ideal body and how it should, and should not, look. Doctors working in the midst of scientific revolution unequivocally tied health to race, gender, and sexuality by enlisting engravers, photographers, and printers to depict the healthy body as a European man and all others as weak, flawed, or ill. This course takes up questions about science, illustration, and identity. Can science tell us who we really are? Do pictures reveal the truth about our bodies? In this class, students will develop their own theory of how science continues to shape who we think we can be and how we might resist those limitations.

HNUH228U A Life Worth Living: The Legacy of Eugenics in Genetics (3 Credits)
Should parents be able to choose their child's eye color? Or alter their child's genome to eliminate a hereditary disability? While these might seem like different concerns, both are eugenic questions. In this class students will learn about the legacy of eugenics and its role in the development of genetics by analyzing science fiction works through the lens of disability studies. We'll explore the past to identify who has historically been considered "fit" and look to the future to consider what kinds of embodiments, and life experiences, society seems willing to let disappear.

HNUH228V At What Cost? An Examination of the Societal and Ethical Impact of Modern Biological Research (3 Credits)
The results of modern biological research are pervasive - from cutting edge medical treatments, to debates about mandatory vaccination, to genetic engineering breakthroughs. This course will examine the social, ethical, and biological costs of research. The focus will be on the larger issues that surround the biology - questions of ethical research, the perception of science versus reality, the intersection of science and society, and even we may need to reconsider the meanings of "self" and "human". Students will reflect on the lessons learned to propose how research can proceed in a way that balances the demands of discovery with social justice and the ethical use of animals and the environment.

HNUH228W Planetary Protection vs. Planetary Imperialism (3 Credits)
International space agencies, such as NASA, ESA, and CNSA, continue to push the boundaries of deep space exploration, buoyed by public excitement, scientific ambition, and political motivation. However, the invasion of alien environments warrants an ethical consideration. What are the risks of forward contamination? What are the potential consequences of reverse contamination? How do we avoid a "space race" incentivized by imperialism? What happens next if we do discover life on another planetary body? This course equips students to grapple with such questions in light of the current state of planetary science, world affairs, and the near-term prospects for the commercialization of spaceflight.

HNUH228X How to Wage War Without Firing A Single Shot: A History of Soft Power and the Cold War (3 Credits)
If you close your eyes and think about war, the first images that pop into your mind are probably soldiers, battles, and military technology--NOT jeans, kitchens, and hockey! And yet, during the Cold War, it was precisely realms like fashion, sports, and music that, for many people of the time, came to define the conflict between the United States and the USSR. This course will explore soft power, or countries' ability to get what they want through attraction rather than traditional force, in the context of the Cold War.

HNUH228Y Interrogating Issues of Piracy/Pirates amidst the Shadowy Landscapes of War & Peace (3 Credits)
Who are pirates and what constitutes piracy in a given era? To what extent do changing notions of piracy reflect major societal transformations at the national, regional and global levels, as well as reveal the contested and often overlapping boundaries of war and peace? How can we use pirates/piracy as a "tool" to engender an historical, economic, political, social, and cultural understanding of global forces and change? Do the legends and myths surrounding infamous pirates represent the realities and relationships of early and new forms of piracy? Could piracy be conceived as a form of counterculture? To what extent do piracy, rivalry, state building, war-making, peace-making all belong on the same continuum? This course examines pirates/piracy as an integral part of major global processes. We will investigate when and why piracy emerged and flourished, and how lawbreakers and lawmakers relate to one another on the murky terrains of power, then explore alternative ways to (re)configure who is a pirate and what constitutes piracy, especially within the dynamics of today's neo-liberal globalization.

HNUH229I The Science, Economics, and Governance of Climate Change: The Need For An Energy Revolution (3 Credits)
Hardly a day goes by without some newsworthy item being reported on Earth's changing climate. Often the stories are contradictory, tainted by parochialism and extremism, not only by the conservative and liberal media, but also by the camps of so-called believers and deniers. This seminar begins with a review of the history of how decisions regarding human interactions with the environment have either doomed past societies to failure or enabled long-term, sustainable success. That sets us up to examine the science of global warming, in a manner accessible to non-scientists, as well as the potential consequences of a rapidly changing climate, and the economics of large-scale renewable resources needed to avert climate catastrophe. During the final few weeks of this seminar, students will work in groups representing various parts of the world to negotiate an international plan to transition the world energy supply to renewable resources that emit little or no greenhouse gases.

HNUH229P Climate in Crisis: Strategy and Advocacy (3 Credits)
This theory and practice track examines theoretical frameworks for understanding climate change and concrete cases that shed light on the complexity of managing it. In this, the practical component of the Climate in Crisis track, we explore several domestic energy and climate policy case studies, examining the competing roles played by various interest groups that influence legislative and regulatory outcomes, with a focus on differing organizational advocacy strategies. Once we have mastered organizational advocacy strategies, students bring those tools to bear on the most recent US Federal policy mandates and legislation. In 229T, students will complement this work with a deep dive into the nature of public goods and climate change policy, among other crucial considerations.

HNUH229T Climate in Crisis: Socio-Environmental Sustainability (3 Credits)
What does it mean to achieve sustainability and how does use of a socio-environmental lens help move the world in that direction? In this, the theory component of the Climate in Crisis track, students will develop an understanding of socio-environmental systems, what they have in common with other complex adaptive systems and the approaches used to study them. With a focus on why a socio-environmental systems approach can help illuminate the environmental, socio-cultural, economic, and intersectional dimensions of sustainability, we will explore what different disciplines bring to this complex topic and use qualitative and quantitative approaches to grapple with problems of sustainability. How do we work with stakeholders to identify the vulnerable, the equitable paths forward, and the trade-offs? Who are the winners and losers of policy decisions? In HNUH229P, students will complement the work of this course with hands-on engagement at the level of Federal policy and legislation.

HNUH238B Systemic Racism in Public Opinion and Policy Attitudes (3 Credits)
If we believe that racism is bad, why do we still support racist policies? No matter how hard we work to end it, the challenge of racism seems here to stay. Though attitudes toward racial segregation in schools have changed, schools are more racially isolated than ever. There is a disconnect in American public life between support for the idea of equality and resistance to policies aimed at addressing racism, and a deep divide over how to eliminate inequality. This course focuses on public opinion and how these attitudes inform public policy. Can we address systemic inequality through public engagement and by changing the national narrative with the support of evidence? Does change come from shifting views or shifting policies? Students will explore these issues through a case study on racial equity in the Honors College. By developing skills in evidence-based op-ed writing and survey-based experiments, students will add their voices to these pressing public debates of our time.

HNUH238C Surveillant Society, Surveillant Selves (3 Credits)
Do the social and individual benefits of surveillance outweigh its risks? Surveillance is a ubiquitous practice in contemporary society. Governments surveil populations; corporations surveil customers and users; and individuals surveil themselves and others. From red light cameras and doorbell security cameras to geo-tracking apps and smart appliances, surveillant practices shape 21st-century lifestyles. Many take these practices for granted as acceptable trade-offs for individual and collective benefits. Others sound the alarm on the dangers of being tracked and monitored, with concerns over individual liberty, social inequalities, and more. In this course we will debate how surveillance shapes social practices and selves. Students will draw their own conclusions about the role of surveillance in society, and what, if anything, should be done to change it.
Credit Only Granted for: HNUH238C or SOCY237.
Formerly: HNUH238C.

HNUH238R Invasive: Feminist Perspectives on Power, Politics, and Ecosurveillance (3 Credits)
Invasive species play a key role in 60% of plant and animal extinctions, constituting a serious threat to global biodiversity and costing over $423 billion annually. But what is at stake in the impulse to frame a species as "invasive"? What modes of watching, tracking, and surveilling emerge in the context of invasive species management? What are the material and ethical implications of these practices? As the cost of invasive species management has quadrupled every decade since 1970 and is likely to continue to increase, what alternatives exist? Reading through the lens of feminist science studies, this course asks what species movement might teach us about the possibilities and challenges of multispecies environmental ethics. Students will examine theoretical, historical, cultural, and practice-based accounts to better understand how our collective and individual actions continue to unevenly shape the biodiversity of our changing planet.

HNUH238U Unequal Opportunity? Race and the Future of American Education (3 Credits)
America's schools are dynamic microcosms of society at large. They simultaneously reflect, reproduce, and shape what happens outside of the classroom, including the many ways that racism affects us all. The educational mechanisms that operate for the benefit of some and to the detriment of others are often hard to see, often because they are hidden in plain sight. For example, national tests are standardized. When racialized differences in test scores appear, they are called "achievement gaps" and the disparity is attributed to essential differences or cultural deficiency rather than inequitable access and opportunity. In this course students will learn methods to critically examine such commonplace notions as the achievement gap and to document their effects on society. They will also develop strategies for self-reflection that enable them to confront inequity in their own educational experience and work to create change.

HNUH238V Still Separate and Unequal? The Enduring Role of Segregation in American Life (3 Credits)
Racial segregation remains an enduring feature of American life today though many believe segregation is a relic of the past. Using an interdisciplinary approach that incorporates history, sociology, political science, and public policy, this course highlights the complex ways in which legacies of segregation continue to shape life in the US. We will identify how federal, state, and local governments endorsed systemic racism through policies that defined the racial geography and resources of racial groups in the US. Students will engage with policy experts to consider the promise and limits of policies that promote integration within communities and the connection between race, spatial location, and current political divisions.

HNUH238X Learning as Deliberation: The Struggle for the Future of Higher Education (3 Credits)
It has been nearly a millennium since European university students first gathered in halls to listen to lectures. With some technological additions (lights, whiteboards, Powerpoints), introductory courses at U.S. universities look pretty much the same. For the past few decades, financial consultants, educators, and students have questioned whether this model of learning makes sense in the 21st century. In 2020, a pandemic gave this question a new urgency. Nothing about the old way of doing things seems inevitable anymore; everything seems up for debate. Should we get rid of lecture halls? What about dorms? The SATs? Tuition? This seminar invites students to deliberate about the current policies and politics of public higher education in the United States. We will study how ancient ideas about merit, democracy, and equity (or lack thereof) have shaped decisions about what higher education should offer and to whom. We will look to alternative traditions of learning with roots in indigenous worldviews, abolitionist organizing, and feminist collaboration, and study how these traditions have challenged and complemented public higher education. As we explore theories and practices of the past and present, students will learn to articulate and advocate for their own priorities as 21st-century citizens of UMD.

HNUH238Z Learning as Deliberation: The Struggle for the Future of Public Education (3 Credits)
This seminar invites students to deliberate about the historical roots of the policies and politics of public education in the United States. We will study how ideas about merit, democracy, and equity (or lack thereof) have shaped decisions about what public education should offer and to whom. We will look to alternative traditions of learning and study how these traditions have challenged and complemented public education. As we explore theories and practices of the past and present, students will learn to articulate and advocate for their own priorities in public higher education as 21st-century citizens of UMD. This course uses project based pedagogy. Students will create a proposal for teaching a facet of American History (Pedagogical Design Project) and engage in peer critique (presentation QA) to hone their critical skills.

HNUH239I Globalization & Sustainability; How Does the Transformation of Global Value Chains Drive Equity and Sustainability? (3 Credits)
We live in an increasingly interconnected world. This course explores the fundamentals of international trade that form the basis for the complex modern network of global value chains and how these relationships can be adapted to address their vulnerability while also transformed to build a more equitable and sustainable future.
Cross-listed with: BMGT271.
Credit Only Granted for: BMGT271 or HNUH239I.

HNUH239P Geopolitics of Finance: A Simulation of the Roller Coasters of Capitalism (3 Credits)
Explores the intersection of money, markets, politics, and power; and the periodic financial crises that leave a lasting, sometimes devastating impact on the global landscape. Students will examine the detritus of 200 years of crises in the United States, from 19th-century booms and busts, to early 20th-century crashes. They will take the roller coaster ride of the 2008 financial crisis, reliving events that left the world reshaped. Students will be primed to examine the ripple effects of financial crises and the role they have played in changing the global socio-economic landscape over the last two centuries. This course is self-contained but paired with HNUH239T in the Geopolitics of Finance track, which explores how globalization has brought about fundamental changes to our daily lives by making the world more interdependent.
Credit Only Granted for: HONR299F or HNUH239P.
Formerly: HONR299F.

HNUH239T Globalization & Innovation: Culture, Creativity, and Competitiveness (3 Credits)
Introduces students to the creative possibilities of the global economy: cross-cultural innovation, collaborative design-driven solutions, and enduring innovation with global purchase. Covers innovations in global business that are transforming the future through an embrace of diverse cultural perspectives. Working with interactive idealized design, out-of-the-box-thinking, and strategic exploration tools, students will explore and experience relevant design to new and cross-cultural value creation. Through rapid prototyping, immersive reflections, and innovative design activities, students will experience how to translate insight into action, and action into tangible results. The evolutionary application of frameworks in this course culminates in a capstone project. This course is self-contained but paired with HNUH239I in the Strategic Cross-cultural Change track, which explores how globalization has brought about fundamental changes to our daily lives by making the world more interdependent.

HNUH248A Identity, Places, & Spaces (3 Credits)
Students in this interdisciplinary course will explore multi-layered issues related to privilege and oppression through their own life experiences via exposure to theory, research, film, memoirs, and current events. Students will evaluate and critique common assumptions about the meaning and experiences of privilege and oppression using Intersectionality theory as a guiding framework. The human experience related to various social identities (i.e., race, gender and gender identity, sexual orientation, social class, religion, age, and ability) will be addressed.

HNUH248B Setting the Table: The Challenges and Opportunities for Sustainable Agriculture (3 Credits)
What will the farm of the future look like? Our current food system is plagued with paradoxes. An estimated 41.2 million Americans are classified as food insecure, but we produce 4,000 calories per person per day. Between 2008 and 2012, 1.6 million acres of long-term grasslands were converted to crop production, yet more than 350,000 acres of farmland were lost to development annually. This course will investigate what determines the food we eat and how we can make changes today that will improve both food access and the environment for future generations. Students will learn agribusiness, as well as alternative food movements and regenerative agriculture. They will meet experts from the USDA and Maryland producers. By growing their own vegetables, tracking food consumption, and exploring family history linked to farming, students will leave the course as conscious consumers empowered to navigate food system reform.

HNUH248D Biophysics of Language (3 Credits)
Can my dog ask questions - and how would my cat answer? A traditional debate concerns whether language is a unique human faculty. While communication systems are common - cetaceans whistle and sing, songbirds and parrots are vocal learners, bees convey information about energy sources - the specific properties of human language, involving finite mental means to socially yield unbounded messages, have not been easy to find in other species. This course delves into the question of whether this quality is unique to humans. The only precondition to take it is the willingness to approach the matter scientifically, starting with notions from a Computational Theory of Mind. Students may bring to bear upon these questions insights from linguistics, psychology, neuroscience, molecular biology, etc., to debate how an abstract systematic behavior can arise within an animal brain, and what that says about evolution.
Cross-listed with: LING272.
Credit Only Granted for: HNUH248D or LING272.

HNUH248R Artificial Intelligence: Critical Examinations through Science Fiction and Technology (3 Credits)
AI permeates our world, but science fiction (SF) told stories about it centuries before AI became a reality in the 1950s, shaping our understanding and expectations through words and images. In this course, students will trace AI's evolution through SF to critically examine how key SF works have shaped how we think about AI and intelligence. Through an exploration of existing AI, like autonomous weapon systems, generative AI, and AI assistants, as well as a visit to UMD's AI department, students will learn to be critical viewers, readers, and developers as they grapple with AI's moral and social implications. Using the context of SF and technological developments, we will explore what the creation, existence, and evolution of fictional and real AI means for technology and humanity.

HNUH248V How Can We Study Environmental Problems? (3 Credits)
How do we study environmental problems? The course provides an overview of the ways social scientists collect information about environmental issues and environmental change, most of which are driven by society and the social world. The course focuses on learning how to collect data that are reliable and applicable to research questions. Through the lens of specific case studies of environmental efforts currently underway, students will learn how to construct a testable hypothesis, design a small-scale research project, and write up the findings of this work to understand environmental issues. They will develop a critical eye to the structure of social science research: identifying the object of inquiry, noting what is being tested; how it is operationalized; and evaluating the quality of the research conducted. The course requires no background or prerequisites.
Credit Only Granted for: HONR249D or HNUH248V.
Formerly: HONR249D.

HNUH248X My Hometown, Our Wilderness: Ecology of Identity (3 Credits)
What has been the setting of your life? Suburbs? Cities? A farm? We may be used to thinking of environments as equal access across society, since everyone is free to visit our National Parks or spend a day at the beach. But there are striking ways in which identity affects our habitat. Race, class, gender, sexual preference, and other markers have strong influences on where we spend our time, what we eat, and how we work and relax. Suburbs, cities, wilds, and farms are not just physical places, they exhibit histories of social inclusion and exclusion. For example, the money and free time of affluent Americans serves as a portal to leisure spaces that would be inaccessible to working-class Americans who lack the ability to take time off, drive or fly long distances, and pay for it all. We'll profile identity ecology through the poetry of African American urban naturalists, essays of wilderness-loving men like Edward Abbey, the comedy of white environmental outrage, and the racialized class tensions in resorts like Aspen, CO. This survey will support your in-depth personal exploration of identity ecology in a collaborative video media project.

HNUH248Y How Do You "Man Up?": Men, Masculinity, and Mental Health (3 Credits)
In August 2018, the American Psychological Association released guidelines regarding the best practices for researchers and mental health professionals when working with boys and men. Many reacted with the question, "are we treating masculinity as a mental health issue?" This course aims to answer that question by taking a historical perspective on how American society has viewed masculinity from the beginning of psychology as a field of study until present day. An intersectional approach will be taken to better understand how race, ethnicity, sexual orientation, gender identity, and socioeconomic status impact men and masculinity. We will address the questions: How does one prove their manhood? How much of masculinity is biological versus socialized? What experiences are unique to men? And how do psychologists and mental health professionals understand and address mental health concerns among men?

HNUH249P National Security: US Foreign Policy (3 Credits)
Following the terrorist attacks of September 11, 2001, the U.S. launched a major effort to dismantle the Taliban and create a sustainable democracy in Afghanistan. In 2021, the Taliban took control of the country. Was the U.S. effort doomed to fail? To answer this question, UH students will partner with peers at the American University of Afghanistan through a virtual global classroom to examine the lessons learned from the U.S. and international presence in Afghanistan over the past 20 years. Through reading assignments and virtual meetings with former senior U.S. and Afghan officials, students will examine the reasons behind the downfall of the country and analyze whether the outcome could have been changed. Students are not expected to have any prior knowledge about the conflict in Afghanistan. This course is self-contained but paired with HNUH249T in the National Security track, which explores debates around efforts to protect the nation from terrorism while preserving our values.
Credit Only Granted for: HNUH249P or HONR269T.
Formerly: HONR269T.

HNUH249T National Security: Domestic Dilemmas (3 Credits)
The police detain a man thought to be plotting a terrorist attack the next day in a U.S. city that would kill or injure thousands. They want to subject him to "enhanced interrogation," which some consider to be torture. Should the police be permitted to use enhanced interrogation techniques? Who decides? This course will ask key questions raised during the efforts of our national security apparatus to protect the nation. Given the tension between the powers of the government to protect citizens, and the necessary limits on that power, what are the fundamental principles that should govern our efforts to protect the nation while preserving our values? Students will try their hand at finding the delicate balance of these principles in difficult national security dilemmas. This course is self-contained but paired with HNUH249P in the National Security track, which explores post-9/11 policy decisions around the U.S. effort to create a sustainable democracy in Afghanistan.
Credit Only Granted for: HNUH249T or HONR278D.
Formerly: HONR278D.

HNUH258C Nature at Risk: Extinction, Consequences, and Strategies (3 Credits)
How should we prioritize among all the species at risk of extinction? This course will grapple with the complex and consequential process of extinction from biological, geographical, and mathematical perspectives. Core themes will include the 1) nature(s) of extinction risks, 2) potential consequences of different kinds of extinction, and 3) considerations involved in setting priorities. Students will explore, handle, and analyze relevant data (e.g., evolutionary trees, species occurrence records, population censuses) to better understand extinction processes. With the aid of AI-generated hypothetical species, we will investigate hidden biases, debate the consequences of our choices, and explore possible prioritization strategies.

HNUH258Q Where the Waters Blend: Contemporary Indigenous Perspectives on History, Traditions, and Modern Issues (3 Credits)
In this unique cultural and personal learning experience, students will explore the history, traditions, and contemporary issues faced by Maryland's Indigenous people, particularly the Piscataway. The course emphasizes the interconnectedness of culture and environment, highlighting how Indigenous Ecological Knowledges shape our understanding of biodiversity and interconnected life. The experiential work of the course asks students to consider how the past matters, particularly when it is embodied in the land they live on, and their present obligations to it. On-campus and place-based learning focuses on the impacts of colonization on the Piscataway - cultural suppression, land displacement, and their effects today - and fosters students' capacity to challenge paradigms that marginalize Indigenous people in our region, nation, and world. Students will emerge with a greater understanding of Maryland's land, the critical role of biodiversity, and the resilience of the Piscataway culture.
Cross-listed with: CPSP220.
Credit Only Granted for: HNUH268W, HNUH258Q or CPSP220.
Formerly: HNUH268W.

HNUH258R Cultivating conservation: exploring connections between biodiversity and livelihoods (3 Credits)
There are a lot of ways food is harvested from land and sea before it reaches your dinner plate - not all of them are savory. In this course, we'll explore how the many livelihoods that provide us with food can also work to incorporate and rely on biodiversity conservation. What does biodiversity conservation look like in a working landscape or seascape? How do social movements align or contrast with different food production and conservation practices? And finally, how are these environments - and the people and cultures embedded in them - increasingly under threat? Through complementary aspects of social science and conservation practice, this course emphasizes not only the threats posed to unique localities and livelihoods, but also the hope of a just and sustainable dinner table. Students will leave with knowledge of the practices and skills needed to participate in transforming our food system for improved environmental and community outcomes.

HNUH258U The Basis of Behavior: Evolution and the Origin of Actions (3 Credits)
Why do some monkeys spend time grooming each other in large groups, while others lose their minds with rage if another monkey comes too close? Complex organisms exhibit behaviors that both fascinate and confound, and the way an animal behaves dictates how it interacts with its environment, with profound consequences. Individual behaviors can have dramatic effects on individual fitness, an individual's groupmates, and even the evolution of species. This leads to a fundamental question in behavioral evolution: why do animals do the things they do? The answer lies in the interaction between individual experiences and eons of natural selection. In this seminar, students investigate what organisms were, what they have become, and why. With a focus on the transitions in behavior that caused single cells to evolve over time into complex societies, students will apply evolutionary principles to individual development and explore how and why individuals choose certain behaviors over others.

HNUH258X Carnal Knowledge: Health, Data, and Power from Enlightenment to WebMD (3 Credits)
"Carnal knowledge" may sound provocative but, in a literal sense, it describes information derived from and about the human body. Consider a ship captain observing the tattoos of sailors to understand their origins, a surgeon examining a cadaver for signs of saintliness, or a natural philosopher ingesting an herb to determine its toxicity. These are instances of carnal knowledge. Historically, such intimate acts turned the body into a site of data collection and a powerful source of information. Both by choice and by force, the instrumentalization of the human body was used to solve scientific problems as well as to justify hierarchies of race and sex. Through a deep engagement with this material, students will connect topics such as the transatlantic slave trade to cell lines as they uncover the embodied relationship between information and power that still shapes our world today.

HNUH258Y The Power of the Writing Voice (3 Credits)
Words have power to ignite political storms, protest movements, and revolutions. Throughout history, writers have used their voices to create stories that have transformed the world. This course will examine powerful voices in history that have inspired social, political, economic, environmental and cultural change. Students will critically examine the power of these voices through the written word, lectures, and various other media. By critically listening to revolutionary speeches and "Soul" music, and by critically reading literature and essays, students will sharpen their own writing voices. As students explore the complex, dynamic relationships between the written word and cultural change, they will gain insight into the nature of power and influence.

HNUH259P Drawn to D.C.: Mapping the City (3 Credits)
Spaces, materials, objects, structures--the building-blocks of cities--index the values of the societies that produce them. By their very nature cities are memory devices. Yet, in an increasingly transient and virtual world, with access to a seemingly infinite amount of memory, what is the status of the spaces we inhabit? This course will explore the relationship among memory, the body and the built environment. Beginning with the role cities play in our individual lives and the construction of personal memories, we will take account of what we forget by remembering and what experiences are missing. Through lectures, seminars and discussions, students will produce short experimental books and pamphlets remapping Washington D.C. and the many invisible - personal - cities it contains. No previous art or design experience required. This course is self-contained but paired with HNUH259T in the Drawn to D.C. track, which explores the created spaces we inhabit, and how they inhabit us.
Restriction: Must have matriculated in University Honors starting in Fall 2020 or later.

HNUH259T Drawn to D.C.: Reading the City (3 Credits)
A movement known as the Metropolitan Revolution has recognized cities as sites of concentrated economic growth and political power. What does that movement have to do with you? Not only does the city change who you are, but the ambitions and fears that you bring to it also alter what is already there. With Washington, D.C. as a case study, this course considers cities in the context of the ambitious plans that developed them and the unbuilt spaces that open us to imagining them anew. From the ideological tensions and competing policies that politicize urban space, to the construction challenges and social implications of choices made, why we build is as important as what we build. We will experience Washington through its history of spaces, stories, music, art; and learn to see ourselves as co-designers of its present. This course is self-contained but paired with HNUH259P in the Drawn to D.C. track, which explores the created spaces we inhabit, and how they inhabit us.

HNUH268A Arbitrating our Bodily Rights: What it Means to Consent (3 Credits)
Both American law and conventional morality support the view that human beings have bodily rights - ones we can waive by giving another person our consent to do what would otherwise be a rights violation. Yet, debate about the sovereignty of an individual's body and the potential rights of others--including the state--over our bodies lies at the core of some of the most contentious issues facing us as a society. This class will investigate the thorny debates that pertain to consent in sexual relations, medicine and research, and bodily markets. What types threats, offers, or cognitive incapacities undermine true consent? How do we evaluate the moral or legal significance of bodily rights when they come into tension with the government's interest? After evaluating arguments, exploring distinctions, and using philosophical tools to arrive at reasoned conclusions about consent, students will learn to apply these conceptual tools to cases from fiction and current events.

HNUH268B Global Heritage (3 Credits)
What traction does the past have in society today? This course explores globally how the past gains traction in society today and becomes remade in the present. That inquiry will be guided by the idea of heritage, as it mobilizes the past within a broad spectrum of social, political, economic, and environmental issues. We will examine western relationships to the past as intimately tied to property and the drive to plunder, collect, and catalogue. Increasingly, conceptions of heritage include landscapes, as well as intangibles such as music, dance, and folklore. This broad definition honors the diversity of present-day relations to the past, even as it strains heritage management models that are organized around definitions and regulations, and bear the weight of historical injustice. Close examination of heritage at work within global crisis and struggle prompts questions on who owns the past, and who owns up to it. What do we owe the past, and will we be good ancestors to the future?

HNUH268C Inclusion and Exclusion: Deportation in American Life (3 Credits)
What is the "American Dream" under threat of deportation? The United States proclaims to be welcoming but ideas about sovereignty, the nation, the border, good and bad immigrants, and crime in the United States coalesce to support the retention of some people and the displacement of others from its territory. Who the US deports is related to why it deports and on whose behalf such policies are made. This course acquaints students with current theories, methodologies, and debates in the field of the Humanities to grapple with the most pressing domestic questions about immigration and deportation. A variety of frameworks and approaches including critical ethnic studies, history, social movements, and geography, will challenge students to take a position on immigration law and deportation, and their effects on different communities - on all of us.

HNUH268H Contested Bodies: Religion, Race, and Narrative (3 Credits)
What does your body express about who you are and what you believe? How do you perceive your body, and what role do public expectations, social values, and cultural norms play in that perception? With Muslim women as our primary case study, this course asks students to engage with the lived experience of bodies perceived as passive, vulnerable, or even violent in the Western context, and to evaluate their construction of agency. Through engagement with politics, religion, race, and transnational feminism, we will explore how bodies are expressed, contested, subjugated, and violated within various configurations of power and governance. We will encounter personal narratives--and create our own--to understand how bodies also resist the persistent forces that seek to shape their image.

HNUH268R What Makes Land a Homeland? (3 Credits)
We live in a world of contested lands. The University of Maryland itself stands on the ancestral land of the Piscataway People. Around the globe, we witness conflicts over land, such as the ongoing war in the Middle East over Israel-Palestine. We hear daily about the refugee crises in Syria and the complex debates surrounding the U.S.-Mexico border. These situations raise important questions: What does it mean to truly belong to a place? How does a migrant come to see their new country as home? This course explores the histories, cultures, memories, and stories of lands left behind to understand how places become homelands. Students will examine the politics behind the making of territories and the deep connections people form with land. Through this exploration, we will center the experiences of migration and displacement, questioning how these journeys reshape our understanding of belonging and the places we call home.

HNUH268W Where the Waters Blend: Contemporary Indigenous Perspectives on History, Traditions, and Modern Issues (3 Credits)
In this unique cultural and personal learning experience, students will explore the history, traditions, and contemporary issues faced by Maryland's Indigenous people. The experiential work of the course asks students to consider how the past matters, particularly when it is embodied in the land they live on, and their present obligations to it. On-campus and place-based learning, focused on the precolonial and colonial histories of Maryland's Indigenous people, and their contemporary issues create opportunities for students to reflect upon and interrogate their understanding of Maryland's past, present, and future. Students will emerge from this course with a greater understanding of the Maryland's Indigenous people and an increased capacity to challenge colonial and postcolonial paradigms that marginalize the Indigenous people in our region, nation, and across the globe.

HNUH268X Sex for Sale: Prostitution in Transnational Perspective (3 Credits)
Can sex be sold? Is prostitution work or violence, and who gets to decide if it is legal or illegal? The sex industry has provoked considerable debate in academia, policy circles, and aid organizations globally. This interdisciplinary seminar will engage with these debates through an exploration of histories of prostitution across time and space, and in a variety of theoretical and material contexts. Our main focus will be on the nineteenth- and twentieth-century U.S., Europe, and the Middle East, but we will also explore cases from Asia, Latin America, and Africa. We will use this transnational lens to interrogate social and cultural assumptions about bodies, agency, and social institutions. We will also consider a variety of social movements from anti-prostitution to SlutWalks, and regulatory policies from criminalization to legalization, and how they intersect with race. This course invites students to move beyond the surface and form their own approach to these body politics.

HNUH268Y The Politics of Disability: Life Narratives & Identity (3 Credits)
The politics of disability are fraught and contentious. This course takes up the experience of disability by asking how and why differently-abled bodies are excluded, marginalized, or threatened. Students will examine these questions through the psychosocial and cultural history of disability, as well as through life narratives and real-world exploration. Beginning with the history of disability, students will gain an understanding of how current disability identity and culture has develop in the US. Students will experience and also produce personal life narratives related to bodily politics and gain insights that help them navigate the politics and participate in the change-making advocacy of disability.
Credit Only Granted for: HONR218V or HNUH268Y.
Formerly: HONR218V.

HNUH268Z Body Boundaries: The science behind asexuality, coloniality, and immortality (3 Credits)
Animal bodies have clear boundaries across space and time - or do they? Although the most familiar animals have clearly delimited bodies and persist only for a certain amount of time, evolution has produced many remarkable animals that defy simple definitions of bodies. Some animals shatter their bodies into pieces to reproduce, generating a collection of identical clones. Others remain physically attached to their siblings or offspring - coordinating activities across attached individuals and functioning as a meta-organism. Still others continually renew their bodies and attain immortality. In this seminar, we will explore the naturally-occurring phenomena that challenge our concept of body. As we analyze the complex ways that bodies relate to one another in the world and broaden the definition of body, students will engage in authentic scientific practices with transferable skills.
Credit Only Granted for: HONR258A or HNUH268Z.
Formerly: HONR258A.

HNUH269P Building Community: How to Make Friends (3 Credits)
In 2017, U.S. Surgeon General Vivek Murthy deemed loneliness an "epidemic." While the rise of social media is meant to foster connection, over 23% of adults report being lonely and social networks have been shrinking for decades. Despite increasing rates of loneliness, it is still possible to overcome these trends and find connection. We tend to assume that we should know how to connect with others intuitively, but, as rising rates of loneliness indicate, this is not the case: connection is something we must learn and practice. In this applied course, students will learn the science of connection and engage in practical activities designed to help them make and keep friends. They will leave the course better able to foster meaningful connections. This course is self-contained but paired with HNUH269T in the Building Community track, where you will learn the social value of showing up, for the world and for yourself.
Credit Only Granted for: HNUH248U or HNUH269P.
Formerly: HNUH248U.

HNUH278A The Research Behind Headlines on Words, Thought, and Behavior (3 Credits)
How does the human mind use language? Type "Language Science News" into your Google search bar. Among the more than 3 billion hits, headlines like "What is love? It depends what language you speak" and "Science's English dominance hinders diversity" invite you to think about the impact of words on thought and behavior. These are stories about how humans acquire and use language, but they ultimately address big questions about how we experience knowledge itself. In a world of unprecedented access to science journalism, did you ever read a headline about human behavior and wonder: How do we know? This class takes up the elegant ways cognitive scientists design experiments to answer crucial questions about language and thought, brain and behavior, that have no intuitive answers. Students will dive deep into the media coverage of their favorite claims about what we know, debate the psychological science behind these claims, and develop transferable critical-thinking skills in the process.
Cross-listed with: HESP214.
Credit Only Granted for: HNUH278A or HESP214.

HNUH278B Democratic Habits (3 Credits)
How do ordinary citizens power democracy? At the age of 18, every American citizen is endowed with the right to vote, but what if democracy demands more than voting? With democratic processes seemingly in peril all around us, what can and should ordinary citizens do to safeguard democracy? Looking beyond the basic right to vote, this class will instead explore the complex ecosystem of citizenship practices necessary for collective self-governance. Turning to both philosophy and history, the course material addresses the power and peril of such civic habits as mutual aid, economic participation, tolerance, attention, organizing, protest, and more. We consider what resources these habits require, what virtues they inspire, and what happens when they conflict with each other. Students in this course will acquire the tools to develop and act on their own answer to the pressing question of what it will take to save democracy.

HNUH278C Riding the Korean Wave: Kdrama, Race, and Global Culture (3 Credits)
How does culture construct our knowledge of the world and ourselves? Using Korean dramas, aka Kdramas, as a case study, this course will explore how various media negotiate blackness for global audiences. As a viral, billion-dollar art form, Kdramas provide an ideal window through which to explore recent trends in our global culture, including colorism, "Black as cool," travel as consumption, and immigration. They illuminate the politics of culture. We will examine how moral panics and social dilemmas are presented in the fictitious world of "Kdramaland," and how they inform our understandings of South Korean society, our own societies, and the world. Drawing on social science research by Koreans and non-Koreans alike, students will debate the ways the culture of the Korean wave reflects, reproduces, and challenges social inequities of marginalized and minoritized groups, as well as how those groups respond, to illuminate the larger global forces at work in intercultural exchange.

HNUH278R Getting Graphic: Comics as Resistance (3 Credits)
In 2023, Maia Kobabe's graphic memoir, Gender Queer, was the most challenged book in the U.S. Often restricted due to spurious claims about corrupting children, comics have a long history of upsetting the status quo with their unique use of words and pictures. Artists from historically marginalized communities continue to shape this medium. This class examines comics, from glossy horror comics to grungy punk zines, that reject the conventional and subvert suppression. Learning experientially through DMV resources like the D.C. Punk and Indie Fanzine Archive and local comics fests, students will generate their own comics and investigate censorship and resistance.

HNUH278U Indigenous Knowledge, Supernatural Remedy, and Collective Action: Lessons from Agrarian Societies (3 Credits)
How were human communities sustained before the rise of capitalism, individualism, and secularism? Where can we look to imagine a world in which modern science, polity, and ethics are not the defining system of civil social? Through an exploration of stories from late medieval Europe, China, Southeast Asia, and other regional communities, with a particular focus on the East, this course aims at de-orientalizing the narratives of the Western world by recovering the collective practices of the global past and present. Interrogating the idea that human history has been a linear process of industrialization and secularization, this course encourages students to reflect on the limits and problems of modernization, and learn from cultures whose practices were displaced or silenced by colonial knowledge production. Students will be empowered to consider, and even envision, alternative versions of modernity and the future of our world.

HNUH278V Climate Change, Infectious Disease, and Civil Society (3 Credits)
Viruses that are lethal to human life have been on earth for centuries. Why are they surging now? And how can we respond to the recent breakneck spread of Coronavirus? This class begins its journey with Homo sapiens, our ancestor that dispersed out of Africa and carried infectious diseases across the planet. Human expansion into new ecosystems also provided opportunities for us to acquire new pathogens. While all of human history is marked by diseases caused by human migration, the Industrial Revolution greatly accelerated human mobility while planting the seeds of the human impact on climate change. Today, the increasingly rapid movement of people and goods, combined with a warming planet and the large-scale disruption of major ecosystems has witnessed an unprecedented spread of infectious diseases. Students will explore how these trends impact our lives and collectively challenge themselves to do what must be done to save our planet and ourselves.

HNUH278X A Way with Words: Order and Knowledge in Enlightenment Europe (3 Credits)
"Without language, things cannot well be expressed or published to the World," wrote Edward Phillips in The New World of English Words (1658). In this course, we will interrogate the power of words to communicate and classify, to impose meaning and order in the historical moment that brought about many of our modern institutions and ways of thinking: the European Enlightenment. From the binomial taxonomies with which Linnaeus ordered "chaos and confusion" to the racist taxonomies deployed to reinforce inequities, we will survey how language facilitated the consolidation of European power at home and abroad. We will further develop the visual literacy to decode how images convey knowledge. Looking back to the period that gave shape to many modern languages, institutions, and divisions of knowledge, we will be poised to face today's crises.

HNUH278Y Science in an Age of Truthiness (3 Credits)
Scientific research has the power to advance understanding, create new technologies, and improve our lives. And yet scientific language - which is essential for these achievements - can be appear opaque and untrustworthy to non-scientists. Indeed, the fact that scientific understanding develops over time can even make the knowledge seem capricious. As a result, science is both unfairly maligned and unrealistically praised, sometimes even in the same breath. Through both the philosophy of science and historical scientific literature, we will survey how scientists have done and expressed science. Students will be empowered to critically evaluate current conceptions of science as these are revealed in the debates around climate change and COVID-19.
Credit Only Granted for: HONR299I or HNUH278Y.
Formerly: HONR299I.

HNUH278Z War of Words: Disinformation and Manipulation (3 Credits)
Examines a global phenomenon that has taken on massive proportions in the world: the spread of disinformation. We will explore types of false information, from misinformation to propaganda, that are designed to manipulate public opinion. We will survey the historical origins of these tactics, from conspiracy theory to racist propaganda, and how they have been used by governments, interest groups and businesses. Through a hands-on exploration of deep fakes and the alteration of text and image, this course will give students the practical skills they need to verify information and fact check. Students will leave the course conversant in the basics of digital safety for content producers.

HNUH288A Welcome to the Party: Race, Nightlife, and Identity in America (3 Credits)
How does play shape our humanity and national identity? We often define people by the work that they do, whereas we tend to think of leisure and after work playfulness as a release from that identity. This course takes up a particular form of play--nightlife--to reckon with how it shapes what it means to be human and how it impacts nationhood, particularly around matters of race and oppression. Spanning from slavery to the present, this course examines how nightlife has been used to deny black people's humanity and been a vital site of playfulness, manifest as joy, resistance, self-making, and aesthetic innovation. Using performance studies to make sense of the world, our explorations will range from cakewalk dance competitions on plantations to queer night clubs. Once students better understand how nightlife is vital to the making and the unmaking of black people's humanity, they will grapple with play as a meaning-maker in their own lives and in our democracy.

HNUH288B Race, Reproduction and Rights (3 Credits)
Can humanity thrive without ensuring reproductive freedom? The 2022 US Supreme Court decision that the right to an abortion is unconstitutional has generated impassioned debate about women's rights and access to reproductive health care in the US and globally. This debate opens space to think beyond "pro-choice or pro-life" polarization and create conditions that promote equity, respect for rights, and a healthy society. These conditions would need to address injustices such as the racism, gender inequalities, marginalization, and colonization that produce disparities in reproductive health care and jeopardize the well-being of individuals, families, communities, and countries. Who controls the bodies of marginalized women and men? What is the meaning of reproductive rights for people who have little power? This course challenges students to bring together multiple disciplines, become critical data consumers, and develop innovative ways to use this knowledge to influence policy.

HNUH288C Abortion in U.S. Society (3 Credits)
How do and can we talk about abortion in contemporary society? Civil discussion around the topic of abortion is almost non-existent between people with extremely different views in the U.S. It is such a taboo topic that an exchange of ideas can even be difficult for those with slightly different views--i.e., those who believe abortion should not be regulated by the government (more than any other health care is) and those who believe abortion should be legal and regulated by governments. Although it is an issue about which Americans care deeply, the very people who need most to talk about it seem unable to find any common ground upon which to begin. This course provides students with a solid base of knowledge needed to form opinions and engage in civil debate. Through an exploration of the different ways we talk about abortion in the U.S. and the sources of those strategies, students will learn to find their voice in the controversial topic.

HNUH288O "Normal Led to This": Health, Global Crisis, and Social Transformation (3 Credits)
From the Spanish flu pandemic of 1918-1920 to the Covid-19 pandemic, and from the appearance of HIV/AIDS in queer communities to its spread in Africa, the world's disease crises have been inflamed by colonialism, imperialism, and other structural forms of exploitation and dispossession. This course asks: What is the connection between seemingly interruptive global health crises and our everyday normal? By engaging with novels, long-form journalism, and other stories of global crises, we will grapple with the possibility that, far from averting disaster, capitalism and the legal structures that support it create the conditions for crises to thrive. We will investigate the failures of public response but also the heroic actions of individuals fighting for life. Students will learn to connect individual experience to broad structural explanations and to analyze historical moments to better understand our present and the shared forces that shape our lives.

HNUH288R Is Black Bad for Your Health? Examining Race as a Risk Factor in Public Health (3 Credits)
Cancer, heart disease, stroke, diabetes, asthma... Not only are Black Americans at higher risk for developing these life-threatening conditions, but they are also at higher risk of dying from them. In fact, Black race, unlike other racial identities, has been so consistently associated with poor health outcomes that "Black" is considered a risk factor--a characteristic that increases the likelihood of developing a disease--for many diseases. Can one's race alone determine their health trajectory? If race is socially constructed, how can race be a risk factor for health outcomes? This class will take up the tensions, contradictions, and seemingly illogical public health practices related to health outcomes for Black Americans and the impact of these practices on the broader community. Students will make sense of our present by examining our past--race science, eugenics, medical apartheid--and learn to disrupt the social reproduction of inequities to create a healthier society for the future.

HNUH288U The Body Knows: Creating Healthy Intimacy on College Campuses (3 Credits)
How do we figure out what we physically desire? How do we know where our boundaries are and how do we communicate that to others? What would it look like to create a campus community where young people are confident about their sexuality and their ability to communicate the nuances of their needs to potential partners? This course is designed as a creative workshop to help students put their own embodied knowledge in conversation with theories and practices of healthy intimacy. Core texts explore the history of sexual violence as a tool of colonization, the relationship between feminism and sex-positivity in popular culture, and the consent theories that have become central to college campus responses to sexual violence. With the help of performance-based techniques, students will have the opportunity to research issues specific to UMD, design curricula for their peers, and advocate for an end to sexual violence on campus.

HNUH288X The Human Interface, from Anatomy to Avatar (3 Credits)
Anthropomorphized pets post on Instagram, FitBits transmit biodata, bots influence elections... In the digital world designed by and for human beings, all sorts of actors imitate people, while people are objectified through surveillance and data mining. Despite a frequent distinction between the internet and 'IRL,' physical bodies are wrapped up in every aspect of existence online: from the factory workers who build our technology to the postures and gestures those devices require us to adopt. Exploring this range of bodily phenomena, this course considers what constitutes a "human body" online and how digitality and connectivity inform our understanding of personhood. From RPGs and dance challenges to AI and visceral responses to internet content, students will analyze the complex relationships between the technological and the embodied, the social and the political, the past and the future.

HNUH288Y What You Are and Why it Matters (3 Credits)
Who you are is interesting and important, but not the subject of this course. What you are is closer to our topic but not yet specific enough; after all, you are many things: a student, a citizen, a driver, a Terp, and so on. This course asks deeper and more elusive questions: what kind of being are you? What is your fundamental nature--the nature you share with others and that simultaneously grounds your individuality? We will work to answer these questions and investigate the limits of our nature, from the possibilities of time travel and teletransportation to the realities of dissociative identity disorder and conjoined twins. The insights we glean will help us grapple with the nature of human existence--from what happens when you die, to our responsibilities toward others, to nothing less than the meaning of life.

HNUH288Z Non-Human Animals in Human Society (3 Credits)
As humans, we share our lives with other animals in diverse and conflicting ways. Non-human animals can be consumed as food, used for scientific research, and treasured as companions. They are commercialized, worshipped, and stereotyped. Our complex relationships with other animals emerge from and fuel debates about what makes "us" different from "them." In this course, we will ask (and attempt to answer) questions such as: What roles do we open to (or force on) non-human animals in American culture and why? Who makes these decisions and what is their effect on animal life? We will explore the evolution of modern human-animal relationships to contextualize major social and scientific debates that have arisen in the last century, including what it means to be human in this context, and why they matter.

HNUH300 Vantage Point Seminar (2 Credits)
Goal-setting and project-design seminar required of all UH students and taken in the second semester of the sophomore year or the first semester of the junior year.

HNUH318T Political Engagement and Advocacy (3 Credits)
An examination of questions and issues in the practice of political engagement and advocacy. Guest lecturers drawn from political, civic engagement, and advocacy arenas will visit class and participate in discussions.
Cross-listed with: FGSM310.
Restriction: Must be in the Federal Fellows Program; and permission of instructor.
Credit Only Granted for: HNUH318T or FGSM310.

HNUH319T Civic Leadership and Human Services (3 Credits)
An examination of important issues, methodologies and tools of civic leadership in relation to human services, especially at the state and local level.
Cross-listed with: FGSM315.
Restriction: Must be in the UMD Fellows Program; and must have permission of the UMD Fellows Program.
Credit Only Granted for: HNUH319T or FGSM315.

HNUH328T Public Health Policy (3 Credits)
An exploration of the major questions and issues facing the U.S. health care system as well as the formulation and implementation of health policy.
Cross-listed with: FGSM320.
Restriction: Must be in the Federal Fellows Program; and permission of instructor.
Credit Only Granted for: UNIV348P, HNUH328T or FGSM320.
Formerly: UNIV348P.

HNUH338T Homeland and National Security Policy (3 Credits)
An examination of the concept of U.S. homeland and national security, threats, and major vulnerabilities in the context of recent history.
Cross-listed with: FGSM330.
Restriction: Must be in the Federal Fellows Program; and permission of instructor.
Credit Only Granted for: UNIV348T, HNUH338T or FGSM330.
Formerly: UNIV348T.

HNUH348T Energy and Environmental Policy (3 Credits)
An examination of issues of energy and environmental sustainability through an investigation of policy-making in energy, climate change, and sustainable development.
Cross-listed with: FGSM340.
Restriction: Must be in the Federal Fellows Program; and permission of instructor.
Credit Only Granted for: UNIV348E, HNUH348T or FGSM340.
Formerly: UNIV348E.

HNUH358T Critical Regions and International Relations (3 Credits)
An examination of international relations and foreign policy challenges in critical regions.
Cross-listed with: FGSM350.
Restriction: Must be in the Global Fellows Program; and permission of instructor.
Credit Only Granted for: HNUH358T or FGSM350.

HNUH359T U.S. Intelligence and Policymaking (3 Credits)
Examines the role of intelligence in supporting U.S. security strategy and policy. Students will learn how the U.S. Intelligence Community (IC) is structured and organized, and will explore how intelligence is deployed to support the warfighter, diplomats, and senior-level decisionmakers. The course emphasizes the development of critical thinking and analytic skills, as well as professional writing and oral presentation abilities that are necessary for successful work in national security organizations. The course will feature guest lecturers from real-world practitioners to supplement course readings.
Cross-listed with: FGSM355.
Restriction: Must be in the Global Fellows Program; and Permission of Department.
Credit Only Granted for: HNUH359T or FGSM355.

HNUH368T U.S. Diplomacy and Policymaking (3 Credits)
An examination of questions and issues in the practice of contemporary diplomacy and policy-making. Guest lecturers drawn from Washington policy-making and foreign service communities will visit class and participate in discussion.
Cross-listed with: FGSM360.
Restriction: Must be in the Global Fellows Program; and permission of instructor.
Credit Only Granted for: HNIUH368T or FGSM360.

HNUH369T Economic Diplomacy: Challenges and Opportunities (3 Credits)
An examination of political, social, and environmental aspects of the global economy in the context of power competition and technological change.
Cross-listed with: FGSM365.
Restriction: Must be in the UMD Fellows Program; and must have permission of the UMD Fellows Program.
Credit Only Granted for: FGSM365 or HNUH369T.

HNUH378T Science Diplomacy: Foreign Policy & Science, Technology, and Innovation (3 Credits)
An exploration of the critical roles scientific knowledge and technological innovation play in the formation and implementation of foreign policy issues, including energy and climate change, public health, space and innovation, and economic development.
Cross-listed with: FGSM370.
Restriction: Must be in the Global Fellows Program; and permission of instructor.
Credit Only Granted for: UNIV389F, HNUH378T or FGSM370.
Formerly: UNIV389F.

HNUH388T Responses to Global Challenges (3 Credits)
An examination of global issues and responses primarily from the perspective of the practitioner. The focus will be on social, humanitarian, and human rights issues in different global contexts.
Cross-listed with: FGSM380.
Restriction: Must be in the Global Fellows Program; and permission of instructor.
Credit Only Granted for: UNIV389B, HNUH388T or FGSM380.
Formerly: UNIV389B.

HNUH398P Federal and Global Experiential Learning (3-9 Credits)
This is the experiential course component of the Federal Fellows Program and Global Fellows Program.
Cross-listed with: FGSM398.
Restriction: Permission of instructor.
Repeatable to: 9 credits if content differs.
Credit Only Granted for: FGSM398 or HNUH398P.

HNUH398T Global Health Challenges and Water Security (3 Credits)
An examination of questions and issues of global health and water security. Expert practitioners will also visit class and participate in discussions.
Cross-listed with: FGSM390.
Restriction: Must be in the Global Fellows Program; and permission of instructor.
Credit Only Granted for: HNUH398T, HONR378M, or FGSM390.

HONR - Honors

HONR100 Honors Colloquium (1 Credit)
Attendance at various additional activities and events is required. Reading and discussion on the personal and social value of higher education; development of a coherent general education program; exploration of the educational and cultural resources of the campus and metropolitan area; participation in a community service project; and other activities designed to broaden students' conception of what it means to be an educated person.
Restriction: Permission of University Honors Program.

HONR149 Honors Colloquium (3 Credits)
A colloquium on a variety of topics.
Restriction: Permission of University Honors Program.
Repeatable to: 9 credits if content differs.

HONR168 Honors Seminar (1-3 Credits)
Restriction: Permission of University Honors Program.
Repeatable to: 9 credits if content differs.

HONR169 Honors Seminar (1-3 Credits)
Restriction: Permission of University Honors Program.
Repeatable to: 9 credits if content differs.

HONR208 Honors Seminar (1-3 Credits)
Restriction: Permission of University Honors Program.
Repeatable to: 9 credits if content differs.

HONR209 Honors Seminar (1-3 Credits)
Restriction: Permission of University Honors Program.
Repeatable to: 9 credits if content differs.

HONR218 Special Topics in Honors College Study Abroad (1-6 Credits)
Special topics courses taken in the Honors College as part of an approved study abroad program.
Restriction: Minimum cumulative GPA of 3.20.
Repeatable to: 15 credits if content differs.

HONR228 Honors Seminar (1-3 Credits)
Restriction: Permission of University Honors Program.
Repeatable to: 9 credits if content differs.

HONR231 London and the British Empire (3 Credits)
Focuses on the people, places, and policies that shaped the development of the British Empire, the single largest trans-cultural phenomenon in the world since 1500. Students examine how ideology, migration, technology and resistance shaped the expansion and eventual retrenchment of British imperial power in the Atlantic world and the Indian sub-continent. With the nation's capital as our classroom, students explore the complex workings and legacies of the British Empire from the perspective of its nerve center. The curriculum illuminates the experience of empire for subjects both in the colonies and the metropole and will pay particular attention to the maritime origins of empire, the lives of black Britons and the abolition of slavery, and the rise and fall of the British in India.
Cross-listed with: HIST231.
Credit Only Granted for: HIST219K, HONR249B, HONR231, or HIST231.
Formerly: HIST219K.

HONR259 Honors Seminar (1-3 Credits)
Restriction: Permission of University Honors Program.
Repeatable to: 9 credits if content differs.

HONR268 Honors Seminar (1-3 Credits)
Restriction: Permission of University Honors Program.
Repeatable to: 9 credits if content differs.

HONR268G The Science of Birdwatching (3 Credits)
In this course you will learn the skill of birdwatching (or "birding") and will contribute your observations to a world database of sightings that help establish trends in overall bird populations. Birding (and bird feeding) is one of the most popular pastimes in the United States, with tens of billions of dollars spent annually by enthusiasts. Birds also tell us about the health of our natural environment: by noting where birds are, and where they are absent, scientists can learn about harmful changes to our world ecosystem and how to reverse them. We can help out by becoming responsible citizen scientists. This course will feature regular field trips to observe birds in their natural habitats. No prior birding experience is needed.

HONR269 Honors Seminar (1-3 Credits)
Restriction: Permission of University Honors Program.
Repeatable to: 9 credits if content differs.

HONR288 Honors Seminar (1-3 Credits)
Restriction: Permission of University Honors Program.
Repeatable to: 9 credits if content differs.

HONR298A Impacts of Globalization (3 Credits)
Introduces students to key global concepts, discusses a range of perspectives on globalization and cultural competence, and offers an applied learning experience.
Prerequisite: CPBE100; or by permission.
Cross-listed with: CPBE270.
Restriction: Students must be matriculated into the College Park Scholars Business, Society & Entrepreneurship (CPBE) program; or by permission.
Credit Only Granted for: CPBE270 or HONR298A.

HONR300 Intergroup Dialogue Facilitator Development & Practicum (3 Credits)
Facilitation is an artform and a science. This course is designed to introduce students to foundational dialogue facilitation skills and social justice frameworks needed to effectively facilitate group interactions across and within social differences. Students will apply the skills learned by facilitating a multi-session dialogue course with either the Common Ground or the Words of Engagement Intergroup Dialogue Program (WeIDP).
Cross-listed with: EDDI300, CPSP300.
Restriction: Permission of the Counseling, Higher Education, and Special Education department.
Credit Only Granted for: WEID300, CPSP300, HONR300, or EDDI300.
Formerly: WEID300.
Additional Information: Students must be given permission to enroll and be admitted to the intergroup dialogue facilitator program.

HONR318 Advanced Honors Seminar (3 Credits)
A series of seminars, often interdisciplinary in character, and sometimes team taught. The subjects will vary from semester to semester.
Restriction: Permission of University Honors Program.
Repeatable to: 9 credits if content differs.

HONR328 Advanced Honors Seminar (3 Credits)
A series of seminars, often interdisciplinary in character, and sometimes team taught. The subjects will vary from semester to semester.
Restriction: Permission of University Honors Program.
Repeatable to: 9 credits if content differs.

HONR349 Honors Colloquium (1-3 Credits)
A series of seminars, often interdisciplinary and sometimes team taught. Subjects may vary.
Restriction: University or departmental Honors student. Or permission of instructor; and permission of Director of University Honors.
Repeatable to: 3 credits if content differs.

HONR358 Honors Practicum (3 Credits)
For student section leaders of HONR100 or HONR200.
Restriction: Permission of University Honors Program.
Repeatable to: 9 credits if content differs.
Formerly: HONR379.

HONR359 Honors Workshop (1-6 Credits)
Honors workshops are small seminar classes which concentrate on skill development.
Restriction: Permission of University Honors Program.
Repeatable to: 9 credits if content differs.

HONR368 Advanced Honors Seminar (3 Credits)
A series of seminars, often interdisciplinary in character and sometimes team-taught. The subjects will vary from semester to semester.
Restriction: Permission of University Honors Program.
Repeatable to: 9 credits if content differs.

HONR368A MGA Legislative Seminar (3 Credits)
Prepares students to intern for the Maryland General Assembly. Introduces standard legislative genres and assigns extended practice in researching legislative issues.
Prerequisite: Students who have taken courses with comparable content may contact the department; or ENGL101.
Cross-listed with: ENGL381.
Restriction: Permission of ARHU-English department.
Credit Only Granted for: HONR368A or ENGL381.
Additional Information: Application required. Contact english@umd.edu for more information.

HONR379 Honors Independent Study (1-6 Credits)
Involves reading or research directed by individual faculty, especially in areas outside of the student's major. Open only to University honors students.
Restriction: Permission of University Honors Program.
Repeatable to: 6 credits if content differs.

HONR379W Maryland General Assembly Writing Internship (6 Credits)
Experiential learning at the Maryland General Assembly (early January through early April). Interns participate in standard office tasks, research legislative issues, and draft legislative texts such as constituent letters, notes on bills, newsletters, policy memos, and testimony. Specific assignments vary according to the host legislator's needs and the intern's schedule.
Prerequisite: ENGL381 or HONR368A.
Cross-listed with: ENGL388M.
Restriction: Minimum cumulative GPA of 3.0; and must have earned a minimum of 60 credits; and must be admitted to the MGA program.
Credit Only Granted for: ENGL388M or HONR379W.

HONR386 Experiential Learning (3-6 Credits)
Prerequisite: Must have a Learning Proposal approved by the Office of Experiential Learning Programs, faculty sponsor, and student's internship sponsor.
Restriction: Junior standing or higher.

HONR388 Honors Thesis or Project (3-6 Credits)
Repeatable to: 6 credits if content differs.
Formerly: HONR370.

HONR389 Guided Honors Teaching (3 Credits)
For HONR100 and HONR200 section leaders. Guided teaching experience for selected students in the University Honors Program.
Restriction: Permission of University Honors Program.
Repeatable to: 9 credits if content differs.

IDEA - Academy for Innovation & Entrepreneurship

IDEA201 Innovation Tools & Mindsets (1 Credit)
Challenges assumptions around what is needed to innovate and who innovators are. Through hands-on activities and reflection, you'll be invited to step out of your comfort zone, think and work in new ways, and gain confidence in your creative abilities.
Credit Only Granted for: IDEA201 or IDEA258A.
Formerly: IDEA258A.

IDEA210 Innovation + Sustainability: Designing your own Sustainable Future (3 Credits)
This hands-on, project-based course tackles the intersection of environment, creativity, and business to develop sustainable solutions to pressing environmental problems. Students work in teams and use design thinking and other human-centered methods to address real-world design challenges. Students will integrate entrepreneurial methods to shape their college and career journey towards a more sustainable future and learn how to motivate and empower others to adopt more sustainable behaviors.
Credit Only Granted for: CPSP249E or IDEA210.

IDEA258 Special Topics in Innovation (1-3 Credits)
Special topics in innovation
Repeatable to: 6 credits if content differs.

IDEA311 Design Your Purpose (1 Credit)
What do you want to do once you graduate? What about with your life? These are the big questions we begin to tackle in this course. Use design methods and mindsets to explore your personal and professional development goals and explore potential career paths. Using empathy, brainstorming, and prototyping techniques, you'll imagine potential futures for yourself and test them to see if they are a good fit for you.
Credit Only Granted for: IDEA311 or IDEA379A.
Formerly: IDEA379A.

IDEA345 Becoming a Design Thinker (1 Credit)
Learn design thinking tools and mindsets to create change in meaningful ways and cultivate your curiosity in this dynamic, hands-on course. Encounter new approaches to learning from others, synthesizing qualitative data, visualizing your ideas, and navigating ambiguity (among others!) while applying the tools and techniques to real-world applications. No prior experience or knowledge of design thinking is needed.
Credit Only Granted for: IDEA247 or IDEA345.
Formerly: IDEA247.

IDEA358 Special Topics in Innovation and Entrepreneurship (1-3 Credits)
Special topics in innovation and entrepreneurship applying concepts in real-world applications
Repeatable to: 4 credits if content differs.

IDEA369 Peer Innovation Coaching (2 Credits)
Deepen your role as an Academy for Innovation and Entrepreneurship Peer Innovation Coach (PIC), where you will be coaching and guiding student teams in the classroom as they learn to use innovation methods. There is both an experiential component and a classroom component. The experiential component involves coaching and teaching innovation class sessions throughout campus, and the classroom component involves discussions, reflection assignments and scenario role-playing to help improve your coaching and teaching. While some of the content in the classroom component will be seeded by a set of course readings, much of it will also be seeded by your own experiences in the experiential component.
Prerequisite: IDEA247; and permission from the Academy for Innovation and Entrepreneurship.
Repeatable to: 6 credits.
Formerly: IDEA358A.

IDEA379 Advanced Topics in Innovation (1-3 Credits)
Advanced topics in innovation
Recommended: IDEA247.
Restriction: Permission of the Academy for Innovation and Entrepreneurship.
Repeatable to: 6 credits if content differs.

IDEA398 Special Topics in Coaching (1-3 Credits)
Special topics in coaching others
Restriction: Permission of the Academy for Innovation and Entrepreneurship.
Repeatable to: 6 credits.

IDEA398C Special Topics in Coaching: Carillon Peer Mentors (2 Credits)
Prepares students to serve as Peer Mentors in the Carillon Studio (IDEA101). Students gain exposure to a variety of design abilities, methods, and mindsets that prepare them to apply human-centered design to their work in and beyond the classroom. Each Peer Mentor is paired with an IDEA101 instructor, and together they teach aspects of design to first-year students in Carillon Communities, leading them through individual and team projects that encourage them to creatively solve problems. Students build upon their prior experiences in Carillon Communities as they develop skills in communication, leadership, mentorship, and design thinking.
Prerequisite: IDEA101.
Restriction: Permission of the Academy for Innovation and Entrepreneurship.

IDEA459 The Innovation Studio: Experience Design in Performance Contexts (3 Credits)
When you think of classical music, do you picture ball gowns, men in powdered wigs, and music to fall asleep to? For many, these common misconceptions create barriers to encountering live classical music. The Academy for Innovation & Entrepreneurship partners with the National Orchestral Institute + Festival to challenge long-standing assumptions and explore the potential for belonging, experimentation, and awe that live classical music offers. This interdisciplinary design studio serves as a collaborative, experiential space to explore and develop ideas for future NOI+F festivals. We'll cover tenets of Experience Design like Phase 0, relational empathy, immersion, world building, and diagramming, and draw on practices such as Futuring, Improv, and Human-Centered Design to create innovative, audience-centered experiments. Whatever your experience level with classical music, design, or powdered wigs, you'll deepen your creative intuition and uncover new ways of working and thinking.
Jointly offered with: IDEA659.
Restriction: Permission of the Academy for Innovation & Entrepreneurship.
Repeatable to: 6 credits.

IDEA498 Independent Study: Experiments in Design and Innovation (1-3 Credits)
Students will work on a self-selected challenge and/or real-world project using design tools and methods, with an emphasis on employing a human-centered, creative problem-solving approach. This course requires a high degree of self-direction in all aspects of the project work, including defining specific milestones and deliverables. There will be regular coaching from an Academy for Innovation and Entrepreneurship team member. Previous design experience required.
Prerequisite: Previous design experience required; and must have Permission of Academy for Innovation & Entrepreneurship .
Repeatable to: 6 credits.
Additional Information: For more information on design see https://innovation.umd.edu/about-us/what-design. Contact department for information to register for this course.

IMDM - Immersive Media Design

IMDM101 Introduction to Immersive Media (3 Credits)
An introduction to the basic practices, concepts and issues in Immersive Media Design. Conducted as a hybrid studio/lecture course, students will work collaboratively in teams to complete both research and practical projects, including surveying current artists and practice in immersive media; completing studio-based interactive projects that fuse computational media into physical objects; and working in teams to ideate and execute large scale, immersive media works.
Restriction: Must not have earned more than 60 credits; or permission of IMDM - Immersive Media Design program.
Credit Only Granted for: CMSC101 or IMDM101.
Formerly: CMSC101.

IMDM127 Creative Coding for Digital Media (3 Credits)
An introduction to the principles of Computer Science supported by exercises in computer programming with an emphasis on creative coding, algorithmic image creation and manipulation, and interactive experiences. Students will make use of both exploratory coding approaches, and problem/solution-driven approaches, to design and implement software with visual and auditory output. The course also includes an introduction to a wide variety of issues relating to computer science and software, including software design and construction, problem-solving, and fundamental questions about the nature, limitations, and ethical use of computers and algorithms. It also explores how creativity tools can be used and as well as providing some insight into how they are implemented. The course is targeted to students with a broad diversity in backgrounds and interests. No prerequisites are assumed beyond high school algebra.
Restriction: Must not have completed any courses from CMSC131-499 course range; and must not be concurrently enrolled in CMSC131.
Credit Only Granted for: IMDM127 or CMSC125.

IMDM150 Digital Media Theory and Culture (3 Credits)
An introduction to the fundamental structures and themes of digital culture in contemporary society. This course will provide you with a theoretical grounding in which to understand the current landscape of digital media culture, design and art. As an introductory course for the Immersive Media Design major, the focus will be on contextualizing immersive digital media such as virtual reality, augmented reality, immersive projection, and electronic art installation through reading, writing and discussion. Students will have opportunities to experience a range of these technologies first hand.
Restriction: Must be in the Immersive Media Design program; or permission of IMDM - Immersive Media Design program.

IMDM227 Introduction to Computational Media (3 Credits)
Comprehensive introduction to programming for visual, auditory and tactile art. Introduction to basic programming constructs, algorithms, data structures, and data transformations for creating and managing multimedia content, and conducting user interaction. Emphasis on programming and software design including the interfaces between hardware and software in multimedia devices, creating graphical user interfaces, and basic graphics and sound rendering.
Prerequisite: Minimum grade of C- in IMDM101; and minimum grade of C- in CMSC131 or (IMDM127 and CMSC122).
Restriction: Must be in the Immersive Media Design program or Permission of IMDM - Immersive Media Design program.

IMDM290 Collaborative Studio I: Image + Time (3 Credits)
Concept-driven and team-based collaborative studio course in which students work together in groups to create intellectually engaging and technically innovative works of Immersive Media Design. Student teams will combine their skill sets, technical and artistic, to produce creative works that combine image manipulation, generative images, creation, image and animation output technologies, video and audio recording, manipulation and production, and other forms of digital media assets that can be integrated into immersive media pipelines such as virtual reality, augmented reality, and other interactive forms. In working collaboratively, student teams will use team and assest management processes and tools that reflects contemporary practices in the fields of art, design, software, and the creative industries.
Prerequisite: Minimum grade of C- in IMDM227 and ARTT255.
Restriction: Restricted to Immersive Media Design Students.

IMDM298 Selected Topics in Immersive Media (1-3 Credits)
Selected topics in current and emerging areas of immersive media.
Restriction: Permission of IMDM - Immersive Media Design program.
Repeatable to: 6 credits if content differs.

IMDM327 Computational Virtual Reality (3 Credits)
Introduction to mechanisms and programming for virtual reality, augmented reality, and related technologies. Covers elements of a standard VR system, including creating, managing and rendering visual and audio VR content, tracking orientation and positions of head mounted display (HMD) and controller, rendering stereo imagery for VR headsets, and implementing approaches for user interactivity.
Prerequisite: Minimum grade of C- in IMDM227 and CMSC132.
Restriction: Must be in the Immersive Media Design, Computing program; or Permission of IMDM - Immersive Media Design program.

IMDM350 Advanced Digital Media Theory (3 Credits)
Advanced theories and concepts pertinent to the fields of immersive media design, new media art, design, and cultural technology. Also looks at ways in which contemporary societal norms are being shaped by game culture, social and mobile media, AR/VR escapism, network aesthetics, hacktivism, open-source culture, neural networks, artificial intelligence, and machine learning, among others. This course addresses the broad range of ways in which the accelerating pace of technological advances influence how we mediate the world around us and examines the environmental, social, political, and ethical implications of its use.
Prerequisite: Minimum grade of C- in IMDM150.
Restriction: Must be in the Immersive Media Design, Emerging Creatives program; or Permission of IMDM - Immersive Media Design program.

IMDM390 Collaborative Studio II: Experiential Computing (3 Credits)
A concept-driven, team-based collaborative studio course connecting inquiry, knowledge, and practice. Students will work together to create experiential works of immersive media. This course moves beyond the technical applications of software and emphasizes innovative thinking, social engagement, and problem-solving. Student teams will draw upon their unique skills to create works that participants can inhabit in a way that can only be achieved using new and emerging technologies. The process starts with small-scale "sketch" creation and evolves into larger-scale compelling works of immersive media. Teams will need to organize research methods and goals, engage in production, and explore how to communicate, display, and document their work. As projects develop, feedback will be provided through periodic presentations, peer-critique sessions, and instructor reviews.
Prerequisite: Minimum grade of C- in IMDM290.
Restriction: Must be in the Immersive Media Design program or Permission of IMDM - Immersive Media Design program.

IMDM398 Special Topics in Immersive Media Design (1-3 Credits)
Seminar course covering special topics in current and emerging areas of Immersive Media Design.
Restriction: Restricted to Immersive Media Design majors with 60 credit hours completed; and permission of Immersive Media Design program.
Repeatable to: 6 credits if content differs.

IMDM399 Independent Study (1-3 Credits)
A directed study in specific readings or topics selected by a student under faculty supervision.
Prerequisite: 6 credits in IMDM courses.
Restriction: Permission of IMDM-Immersive Media Design.
Repeatable to: 6 credits if content differs.

IMDM490 Senior Capstone I (3 Credits)
The first course in a two-semester senior capstone sequence. During IMDM490 students will research, design and prototype a large-scale immersive media design project, in preparation for fully implementing and exhibiting the project in IMDM491 Capstone II. Students will have the opportunity to apply design and technical skills they have acquired in previous courses as well as focus on the organizational and production skills needed for a substantial, longer term project to achieve an artistic or technical goal.
Prerequisite: Minimum grade of C- in IMDM290.
Restriction: Must be in Immersive Media Design major Computing or Emerging Creatives track; and must have earned a minimum of 86 credits.

IMDM491 Senior Capstone II (3 Credits)
The second course in a two-semester senior capstone sequence. During IMDM491 students will continue to design, prototype and realize a large-scale immersive media design project intended for public exhibition. In doing so, students will adapt and improve their project in response to critical feedback from instructors and peers, to find an exhibition venue, and to market the project through public relations, social networking, and other strategies of promotion.
Prerequisite: Minimum grade of C- in IMDM490.
Restriction: Must be in the Immersive Media Design program.

IMDM498 Special Topics in Immersive Media (1-3 Credits)
Special topics in current and emerging areas of Immersive Media Design.
Restriction: Permission of Immersive Media Design program.
Repeatable to: 9 credits if content differs.

IMDM499 Independent Undergraduate Research (1-3 Credits)
Directed research under the supervision of a faculty member in immersive media. Students and supervising faculty member will agree to a research plan which must be approved by the department. As part of each research plan, students should produce a final paper on their research.
Restriction: Must be in one of the following programs (Immersive Media Design: Computing, Immersive Media Design: Emerging Creatives); and Permission of IMDM-Immersive Media Design.
Repeatable to: 6 credits.

IMMR - Immigration Studies

IMMR200 Introduction to Immigration and Migration Studies (3 Credits)
Introduces concepts and theoretical interpretations about the causes of international migration; provides an historical overview of the main flows of immigration to the U.S.; analyzes economic, political, social, and cultural aspects that impact the immigrants' settlement process.

IMMR219 Special Topics in Immigration and Migration Studies (3 Credits)
Thematic exploration of a topic in immigration or migration studies history at an introductory level withemphasis on understanding how the movement of people is relevant in the contemporary world.
Repeatable to: 6 credits if content differs.

IMMR219C Immigration Policy, Immigrant Lives (3 Credits)
An examination of the phenomenon of international migration, or immigration. Students develop awareness of how immigration has been framed in the general public and examined by social science disciplines, most prominently anthropology. Examination of case studies of different immigrant groups in distinct geographic contexts will illuminate the varied incorporation experiences of immigrants into U.S. society.
Cross-listed with: ANTH264.
Credit Only Granted for: ANTH264 or IMMR219C.

IMMR319 Special Topics in Immigration and Migration Studies (3 Credits)
Thematic exploration of a topic in immigration or migration studies with emphasis on understanding how the movement of people is relevant in the contemporary world.
Repeatable to: 6 credits if content differs.

IMMR394 Growing Up Asian American: The Asian Immigrant Family and the Second Generation (3 Credits)
An interdisciplinary course examines the experiences of children of Asian immigrants in the U.S., focusing on intergenerational dynamics in the Asian immigrant family, their intersections with race, gender, class, sexuality, and religion, and how these shape second-generation Asian American life. Topics include identity and personhood, the model minority myth and education, work and leisure, language and communication, filiality and disownment, mental health and suicide.
Cross-listed with: AAST394, AMST324.
Credit Only Granted for: AAST394, AAST398E, AMST324, AMST328V, IMMR319G or IMMR394.
Formerly: AAST398E.

IMMR399 Internship in Immigration/Migration Studies (1-6 Credits)
Internship experience with an organization that works with or studies migration or immigrant populations. This experiential learning course provides training that enriches the students' academic field of study and the IMMR transcript notation. Students submit a final written report of how the experience ties into their major field of study.
Prerequisite: HIST222, IMMR200, or IMMR400; and permission of the Center for Global Migration Studies required.
Restriction: Minimum cumulative GPA of 2.5; and must have earned a minimum of 60 credits.
Repeatable to: 6.0 credits if content differs.
Additional Information: This course is intended primarily for students seeking the Immigration and Migration Studies transcript notation, but exceptions will be considered for students with educational or career interests that lie in this area. Student internships must be approved by the Executive Director of the Center for Global Migration Studies. Students must secure an appropriate faculty mentor for the internship course. An internship course will be approved only if a faculty supervisor is available.

IMMR400 Vital Voices: Oral Histories of the Immigrant Experience (3 Credits)
An exploration of the dynamic subject of U.S. immigrant experience through the scope of individual immigrant life stories in a global context. Course will include an overview of U.S. and global immigration patterns and an introduction to the practice of oral history.
Recommended: HIST222; or IMMR200.
Credit Only Granted for: HIST428N, IMMR400, THET428I, or THET498V.
Formerly: HIST428N.

IMMR419 Special Topics in Immigration and Migration Studies (3 Credits)
Thematic exploration of a topic in immigration or migration studies history with emphasis on understanding how the movement of people is relevant in the contemporary world.
Repeatable to: 6 credits if content differs.

INAG - Institute of Applied Agriculture

INAG100 Introduction to Plant Science (4 Credits)
A general introduction to plant science designed to provide the students with a working knowledge of the fundamental structures and processes of plants. Content includes plant anatomy, physiology, genetics and environmental relationships.
Restriction: Must be a student in the Institute of Applied Agriculture; or permission of AGNR-Institute of Applied Agriculture department.
Credit Only Granted for: INAG100, PLSC100, PLSC101, PLSC110 or PLSC112.

INAG102 Agricultural Entrepreneurship (3 Credits)
This course introduces fundamental concepts related to launching a profitable agricultural business. Topics include idea generation, opportunity recognition, conducting feasibility studies, assembling the entrepreneurial team, and financing the new venture, among others. Students will learn knowledge and skills relevant to starting a new agricultural business.
Restriction: Must be in a major in AGNR-College of Agriculture & Natural Resources; or permission of AGNR-Institute of Applied Agriculture department.
Additional Information: Priority in enrollment will be given to students within the Institute of Applied Agriculture. May not count toward any BMGT major or minor requirement.

INAG103 Agricultural Marketing (3 Credits)
Principles of market demand are used to develop a consumer oriented market strategy for agricultural businesses. Topics include market structures, target marketing, market segmentation, niche marketing and direct marketing. Market concepts unique to agriculture products are also covered.
Restriction: Must be in a major in AGNR-College of Agriculture & Natural Resources; or permission of AGNR-Institute of Applied Agriculture department.
Additional Information: Priority in enrollment will be given to students within the Institute of Applied Agriculture. Course cannot be used to fulfill a requirement for a Robert H. Smith School of Business major or minor.

INAG105 Soils and Fertilizers (3 Credits)
Soils and Fertilizers is an introductory course for students entering careers related to applied agricultural production. The course is divided into three subject areas: soil properties, soil fertility, and environmental concerns of using soils for agricultural production. Emphasis is placed upon the characteristics of Maryland soils which are similar to the soils in the mid-Atlantic region. The importance of nutrient management and non-point source pollution of the Chesapeake Bay are covered in the course.
Restriction: Must be in a major in AGNR-College of Agriculture & Natural Resources; or permission of AGNR-Institute of Applied Agriculture department.

INAG106 Pesticide Use and Safety (2 Credits)
An overview of pesticide use and safety. Topics include environmental protection, labeling, personal safety, first aid, formulation and chemistry, equipment, disposal, storage, record-keeping and liability. The course prepares students to take the Maryland State test for a private applicator's license.
Restriction: Must be in a major in AGNR-Institute of Applied Agriculture department; or must be in a major in AGNR-College of Agriculture & Natural Resources; or permission of AGNR-Institute of Applied Agriculture department.
Additional Information: Priority enrollment will be given to students in the IAA program or to students in the College of Agriculture and Natural Resources (AGNR).

INAG110 Oral Communication (3 Credits)
A study of how perception, self-concept, and verbal and nonverbal communications affect the communication process as it emerges in the workplace. The course provides skill training in speech writing, public speaking, group communication, interpersonal communication, listening, and responding.
Credit Only Granted for: COMM107, COMM200, INAG110, JOUR130, THET285.

INAG123 People, Planet, and Profit: Digging Into Sustainable Agriculture (3 Credits)
Is it possible for agricultural producers to make a living and feed the world nutritious, culturally inclusive food while protecting--or even restoring--the environment? This course investigates the principles and practices of sustainable agriculture and their relationship to the greater food system. We will explore the social (people), environmental (planet), and economic (profit) impacts of agriculture - from challenges to opportunities. INAG123 applies the principles of sustainability to various agricultural production practices and systems - at a range of different scales - to see what lessons these varied models can offer. Along the way, we will consider domestic issues such as food safety and distribution, food justice, cultural relevance, biodiversity, farming communities, and effects on local economies.

INAG131 Introduction to Agricultural Policy and Communication (3 Credits)
Introduction to Agricultural Policy and Communication equips students with the knowledge and skills needed to engage in real-world communication around timely issues in agriculture. This course covers basics of United States government and the policymaking process, current and historical policy issues in agriculture, advocacy communication strategies and tactics, and careers in policy and advocacy. This course focuses on practical skills application, as well as exposure to government and advocacy work in action, including field trips and guest speakers. Throughout the course, students will learn and practice communication methods both individually and in team-directed agriculture-related projects.
Restriction: Must be a student in the Institute of Applied Agriculture; or must be in a major in AGNR-College of Agriculture & Natural Resources; or permission of AGNR-Institute of Applied Agriculture department.

INAG132 Agricultural Leadership and Teamwork (3 Credits)
Introduces fundamental concepts related to leadership and teamwork in agricultural organizations. Topics include leadership practices and skills; relationships between leadership, authority, power, and ethics; team decision-making and management; and organizational culture and change. Students will develop effective leadership skills necessary for leading agricultural organizations.
Restriction: Students at the Institute of Applied Agriculture (IAA); or students at the College of Agriculture and Natural Resources (AGNR); or permission may be granted to other students based on available space.

INAG201 Agricultural Human Resources Management (3 Credits)
The course introduces students to the study and application of the basic principles of human relations and personnel management. A variety of approaches to recruiting, training, delegating, motivating, and appraising employees are among the topics discussed.
Restriction: Must be in a major in AGNR-College of Agriculture & Natural Resources; or permission of AGNR-Institute of Applied Agriculture department.
Additional Information: May not count toward any BMGT major or minor requirement.

INAG203 Agricultural Finance (3 Credits)
This course introduces fundamental concepts related to the financial management of an agricultural business. Topics include financial statement analysis, financial planning, the relationship between risk and return, the time value of money, costs associated with borrowed funds, sources of capital, financial markets and intermediaries in agriculture, and personal finance, among others. Students will gain financial knowledge and skills necessary for managing a profitable agricultural business.
Restriction: Students at the Institute of Applied Agriculture (IAA); or students at the College of Agriculture and Natural Resources (AGNR); or permission may be granted to other students based on available space.
Additional Information: Course cannot be used to fulfill a requirement for a Robert H. Smith School of Business major or minor.

INAG204 Agricultural Business Management (3 Credits)
This course integrates various concepts related to managing a profitable agricultural business. Topics include business management and decision making, preparing a business plan, financial analysis and budgeting, risk and investment management, and small business taxes, among others. Students will gain relevant knowledge and skills as they complete the comprehensive business plan for successfully managing an agricultural business.
Recommended: INAG102.
Restriction: Must be in a major in AGNR-College of Agriculture & Natural Resources; or permission of AGNR-Institute of Applied Agriculture department.
Additional Information: Priority in enrollment will be given to students within the Institute of Applied Agriculture. May not count toward any BMGT major or minor requirement.

INAG205 Analyzing Alternative Enterprises (3 Credits)
This course identifies and analyzes alternative crops, livestock, and other agricultural business enterprises. Students assess sustainability, geographic adaptability and potential profitability of businesses through lectures, class projects, and presentations from farmers, entrepreneurs, and managers engaged in alternative enterprises. Topics may include value added approaches, organic crop production, and recreational agricultural pursuits.
Restriction: Must be in a major in AGNR-College of Agriculture & Natural Resources; or permission of AGNR-Institute of Applied Agriculture department.
Additional Information: Priority in enrollment will be given to students within the Institute of Applied Agriculture.

INAG206 Agricultural Business Law (3 Credits)
This course introduces various legal concepts and their relationships to agricultural business and transactions. Topics include torts, criminal law, contracts, promissory notes, property, partnerships, business entities, employment, and bankruptcy, among others. Students will gain a general understanding of the legal system that will help them manage and/or operate profitable agricultural businesses.
Restriction: Students at the Institute of Applied Agriculture (IAA); or students at the College of Agriculture and Natural Resources (AGNR); or permission may be granted to other students based on available space.
Additional Information: Course cannot be used to fulfill a requirement for a Robert H. Smith School of Business major or minor.

INAG207 Power and Machinery (4 Credits)
The basic principles of compact equipment management, including selection, maintenance, operation, adjustment and troubleshooting of agricultural machinery and power units. Covers methods of power development, measurement, and transmission, through power trains both mechanical and hydraulic. Each student will complete a systematic disassembly, analysis, diagnosis and reassembly of a small engine.
Prerequisite: INAG250 or PLSC204.
Restriction: Must be in a major within the AGNR-Institute of Applied Agriculture department; or permission of AGNR-Institute of Applied Agriculture department.
Additional Information: Priority will be given to IAA students and permission will be granted to AGNR students and others on a space available basis.

INAG208 Understanding Turfgrass: Preparation for Intercollegiate Turfgrass Competitions (1 Credit)
This course reinforces students' understanding of turf agronomic and integrated pest management principles of turfgrass management. This class is designed to prepare students for intercollegiate turf science competitions: the Golf Course Superintendents Association of America Turf Bowl and the Sports Field Managers Association Student Challenge. While the basic content areas in the course schedule will remain the same, this course will be tailored each year to reflect current trends in the turf industry.
Restriction: Must be in the Institute of Applied Agriculture; or must be in a major in the College of Agriculture and Natural Resources; or by permission of the department.
Repeatable to: 4 credits.

INAG213 Crop Production Practices (3 Credits)
Crop Production Practices covers the applied methods of producing various vegetable and agronomic crops in Maryland. This course focuses on commercial scale production where economics impact production decisions. Topics include crop rotation, cropping systems, nutrient management, and integrated pest control strategies. Throughout the course, economically, socially and ecologically sustainable production practices will be addressed.
Restriction: Must be in a major in AGNR-College of Agriculture & Natural Resources; or permission of AGNR-Institute of Applied Agriculture department.
Additional Information: Priority in enrollment will be given to students within the Institute of Applied Agriculture.

INAG214 Agronomic Principles of Golf Turf Management (3 Credits)
An in-depth study of golf course management practices such as turfgrass selection, fertilization, mowing, irrigation, and cultivation practices. Weed control programs will be discussed in detail for the different playing surfaces on the golf course. Field plot work, laboratory work, and field trips will reinforce lecture material.
Recommended: INAG107; or PLSC305.
Restriction: Must be in a major within the AGNR-Institute of Applied Agriculture department; or must be in one of the following programs (Plant Sciences; Plant Sciences: Horticulture & Crop Production; Plant Sciences: Landscape Management; Plant Sciences: Plant Science; Plant Sciences: Turf & Golf Course Mgmt; Plant Sciences: Urban Forestry) ; or permission of instructor.
Additional Information: Enrollment priority is given to students within the Institute of Applied Agriculture (IAA) and the Plant Science and Landscape Architecture Department.

INAG215 Business Management Principles for Turf Facilities (3 Credits)
An advanced course in turfgrass management with emphasis on development of maintenance operating budgets for labor, fertilization, pest control, and supplemental cultural practices for golf courses and athletic field facilities. An overview of the current trend in golf course design and construction and in athletic field construction practices will be covered. Students will be responsible for a presentation concerning some phase of turfgrass management relating to golf course or athletic field operations.
Recommended: INAG107; or PLSC305.
Restriction: Must be in a major within the AGNR-Institute of Applied Agriculture department; or must be in one of the following programs (Plant Sciences; Plant Sciences: Horticulture & Crop Production; Plant Sciences: Landscape Management; Plant Sciences: Plant Science; Plant Sciences: Turf & Golf Course Mgmt) ; or permission of AGNR-Institute of Applied Agriculture department.
Additional Information: Enrollment priority is given to students majoring in Turfgrass and Golf Course Management in the Institute of Applied Agriculture and Plant Science and Landscape Architecture.

INAG224 Greenhouse and Plant Production Management (3 Credits)
Principles of managing greenhouses--structures, coverings, lighting, irrigation, heating and cooling systems--and their effects on plant production. Plant propagation methods and environments will be analyzed and practiced.
Restriction: This course is open to students in AGNR. Priority enrollment will be given to students in the Institute of Applied Agriculture. All other majors will be granted permission based on available space.
Credit Only Granted for: INAG 114 or INAG 224.

INAG226 Diseases of Ornamentals and Turf (3 Credits)
The course will cover various topics such as plant pathology, disease control practices, and an in depth coverage of the major diseases of ornamentals and turfgrasses in the Mid-Atlantic region. Emphasis will be placed on identification of disease signs and symptoms. Over 50 diseases will be covered during the semester.
Recommended: Completion of one of the following is recommended: PLSC 253, PLSC 254, INAG 107, PLSC 305.
Additional Information: Priority in enrollment will be given to students within the Institute of Applied Agriculture.

INAG231 Insects of Ornamentals and Turf (3 Credits)
A study of the major insect pests and beneficial insects of ornamental plants and turfgrasses in the Mid-Atlantic region. The student will be responsible for insect identification, life history, and control practices of approximately 100 insects. An insect collection consisting of both insect pests and beneficial insects is required.
Recommended: PLSC253, PLSC254, or PLSC305; or INAG107.
Restriction: Must be in a major in AGNR-College of Agriculture & Natural Resources; or permission of AGNR-Institute of Applied Agriculture department.
Additional Information: Priority enrollment will be given to students in the IAA program.

INAG235 Irrigation and Drainage (3 Credits)
An overview of U.S. and state water doctrines and plant water use rates. Irrigation systems for residential and athletic field use will be discussed covering such topics as hydraulics, sprinkler spacing, pipe selection and sizing, pumps, controllers, valves, and irrigation trouble shooting. Surface and subsurface drainage for turfgrass sites will also be covered.
Restriction: Must be in a major within the AGNR-Institute of Applied Agriculture department; or must be in a major in AGNR-College of Agriculture Natural Resources; or permission of AGNR-Institute of Applied Agriculture department.
Credit Only Granted for: INAG235 or PLSC235.
Additional Information: Priority enrollment will be given to IAA and PLSC majors. By permission for available seats.

INAG237 GPS & Drone Applications in Surveying (3 Credits)
The principles of land measurement using Global Positioning System (GPS) devices and Unmanned Aerial Vehicles (UAVs--i.e. drones) to collect data and generate maps. Students will use Pix4D and Trimble TerraFlex software to post-process collected data and learn how we can use this data to make informed land management decisions. Students will also be prepared to successfully earn their Part 107 Commercial Drone Pilots License as part of the course.
Restriction: Must be an Institute of Applied Agriculture student; or permission of the Institute of Applied Agriculture.
Additional Information: Course is open to Institute of Applied Agriculture students and permission will be granted to other students based on available seats, with priority given to students from majors in the College of Agriculture and Natural Resources.

INAG242 Golf Course Design and Construction (3 Credits)
An appreciation and understanding of the game of golf is obtained through lectures on the history, organizations, and rules of the game. Golf course design theories, great architects and their courses, and construction specifications are discussed. Students will complete two golf course design projects.

INAG244 Herbaceous Plants (3 Credits)
Herbaceous plants are integral components of residential and commercial landscapes. Students will become familiar with 250 annual and perennial plants. The emphasis will be on plant management requirements and seasonal variation in the landscape.
Restriction: Must be in a major within the AGNR-Institute of Applied Agriculture department; or must be in a major in AGNR-College of Agriculture & Natural Resources; or permission of AGNR-Institute of Applied Agriculture department.
Credit Only Granted for: INAG244 or PLSC244.

INAG248 Topics in Sustainable Agriculture (2 Credits)
Through readings, class discussions, and guest speakers, this seminar course exposes students to current trends, concerns and research in sustainable agriculture and food systems. It allows students to explore various interest areas and discuss a variety of topics as they relate to sustainable practices.
Recommended: INAG123.
Repeatable to: 2 credits if content differs.
Additional Information: The topics covered in this course change every year, guided by student interest, current research, and availability of guest speakers.

INAG250 Fundamentals of Agricultural Mechanics (4 Credits)
Comprehensive coverage of the fundamentals of agriculture-related mechanics. Lecture and lab exercises will cover a broad range of topics including electricity, plumbing, welding processes, and wood and metal working applications. Emphasis will be given to the design and installation of electrical circuits. It will also include project planning and implementation, including development of safety protocols for each area of study.
Restriction: Must be in a major in AGNR-College of Agriculture & Natural Resources, OR Permission of AGNR-Institute of Applied Agriculture Department.
Credit Only Granted for: PLSC204 or INAG250.
Additional Information: Priority given to IAA majors and AGNR students whose major requires this course. Permission will be granted to other students on seats available basis.

INAG251 Landscape Construction (3 Credits)
An introductory course in the basics of hardscape topics in landscape construction. Covers fundamental construction layout using surveying techniques; GPS; elements of construction dealing with wood, concrete, masonry, pavers, and/or electrical amenities used in hardscape construction. Emphasis will be placed on safety, interpretation of construction drawings or plans, specifications for specific structures, materials selection, cost estimations, site preparation and typical construction techniques.
Prerequisite: INAG250 or PLSC204.
Restriction: Must be in a major in AGNR-College of Agriculture & Natural Resources.
Additional Information: Priority enrollment is given to Landscape Management majors in the Institute of Applied Agriculture.

INAG252 Agricultural Public Relations (3 Credits)
Introduces the fundamental concepts and procedures of public relations in agriculture. Topics include understanding external audiences; key practices in agricultural media relations, social media, executive communication, and crisis communication; and managing the research, planning, and evaluation aspects of the public relations process. Students will gain the public relations knowledge and skills necessary for communicating effectively with an organization's external audiences.
Recommended: INAG103.

INAG253 Agricultural Strategic Communication (3 Credits)
Introduces the fundamental concepts and applications of strategic communication in agricultural organizations. Topics include strategic communication planning; communication and culture; communication and change; managing internal and external communication; and corporate responsibility. Students will learn how to use communication to accomplish organizational goals.
Recommended: INAG252.

INAG272 Principles of Arboriculture (3 Credits)
The establishment and maintenance of healthy trees in an urban setting will be studied. Lectures will focus on the environmental constraints to tree development in the city, and the role of physiological processes in regulating tree vigor. Laboratory exercises will cover the unique aspects of urban soils, tree valuation procedures, pruning and training, and supervised climbing.
Cross-listed with: PLSC272.
Credit Only Granted for: INAG272 or PLSC272.

INAG288 Internship (1 Credit)
On-site internship training in the student's major area of study. Students must complete a minimum of 320 working hours at an approved work site. Course work also includes weekly written assignments and a site visit assessment.
Restriction: Must be enrolled in the Institute of Applied Agriculture; or permission of the Institute of Applied Agriculture.
Repeatable to: 2 credits.

INAG289 Internship Experience & Professional Development (3 Credits)
Professional development and reflective analysis of the experience from the Practicum (INAG 288). Based on their 320-hours of internship work experience, students will write an internship report and analysis, deliver an oral presentation, and develop professional skills and materials needed to enter their careers.
Prerequisite: INAG288.
Restriction: Must be enrolled in the Institute of Applied Agriculture students; or permission of the Institute of Applied Agriculture.

INST - Information Studies

INST101 Bits and Bytes of Computer and Information Sciences (1 Credit)
Students are introduced to the fields (and disciplines) of computer science and information science within a small classroom setting. They will learn to make a successful transition from high school to the university, while exploring study skills, student success plans and research opportunities.
Cross-listed with: CMSC100.
Restriction: For first time freshmen and first time transfer students; or permission of CMNS-Computer Science department.
Credit Only Granted for: CMSC100 or INST101.

INST104 Design Across Campus (3 Credits)
What is design, who does it, and how is it done? There is no one answer to this question--it depends on who you ask. The answers to these questions vary across disciplines and across the University campus. This course, designed with modules from contributors in UMD programs including Information Studies, Human-Computer Interaction, Graphic Design, Immersive Media Arts, Journalism, Architecture, Landscape Architecture, Engineering, and Policy, will introduce students to the goals and values, approaches, skills, and practices of diverse fields of design. It will enable students to identify grand challenges in design and serve as a sorting hat to help students find a design practice that matches their own values, approaches, skills and goals.

INST123 Databases for All (3 Credits)
An introduction to relational databases for students with no previous programming experience. Provides a means for students of diverse backgrounds to successfully learn how to store, retrieve, and maintain data in relational databases. Topics include a brief comparison of database systems with an emphasis on relational databases, fundamental relational database concepts, and data types. Includes technical approaches to accessing information stored in relational databases.
Restriction: Must not have completed or be currently taking INST327 or BMGT402.

INST126 Introduction to Programming for Information Science (3 Credits)
An introduction to computer programming for students with very limited or no previous programming experience. Topics include fundamental programming concepts such as variables, data types, assignments, arrays, conditionals, loops, functions, and I/O operations.
Prerequisite: Math placement of STAT100 or higher.
Restriction: Must not have completed INST326; and must be in Information Science, Technology and Information Design, or Social Data Science programs.

INST127 Introduction to Programming for Information Science Lab (1 Credit)
Laboratory component of INST126, Introduction to Programming for Information Professionals, is designed to complement the lecture and provide structured exercises and activities for students to practice and develop programming skills. INST 126 is an introduction to computer programming for students with very limited or no previous programming experience. Topics include fundamental programming concepts such as variables, data types, assignments, arrays, conditionals, loops, functions, and I/O operations.
Corequisite: INST126.

INST151 Becoming A Social Media Influencer (3 Credits)
Teaches students how to create, grow, and manage influential social media accounts. Topics will include tools for content creation, analyzing and strategizing with analytics, building community, and defining their niche and approach.
Credit Only Granted for: INST408N or INST151.
Formerly: INST408N.

INST152 "Fake Checking": Battling Misinformation and Disinformation in the Real World (3 Credits)
Examining the phenomenon of "fake news" using the principles of information literacy, students will develop their skills in locating, analyzing, and evaluating different information sources -- in the classroom, in their personal lives, and in the workplace.

INST153 Records Scandals & Data Vandals: Public & Private Sector Controversies Ripped From The Headlines (3 Credits)
Expressly organized around case studies about well-known individuals and organizations involved in scandals and controversies that have generated headlines around the world. It places these events in a larger historical, legal, technological, ethical and societal context. Drawing upon contemporaneous records in a variety of media, as well as presentations from invited speakers representing the greater archival, historical, and public interest communities, the course seeks to deepen students' appreciation of the role that records and information plays in issues going to the heart of government transparency, corporate accountability, and social justice.

INST154 Apollo at 50 (3 Credits)
Examines Apollo mission, one of the greatest engineering accomplishments of all time, in which Neil Armstrong walked on the moon. Since the mission, people have asked: if we can land on the moon, why can't we eliminate poverty? Why can't we cure cancer? Why can't we prevent global warming? Asks what were the social, political, financial, scientific, engineering, operational, and human aspects of the Apollo program that came together to make the moon landings possible?

INST155 Social Networking (3 Credits)
Introduces methods for analyzing and understanding how people use social media - social networking websites, blogging and microblogging, and other forms of online interaction and content generation - and their societal implications. Introduces students to the science and social science of network analysis. Through real world examples, including analysis of their own social networks, students develop skills for describing and understanding the patterns and usage of services like Facebook, Twitter, YouTube, and others.
Credit Only Granted for: INFM289I or INST155.
Formerly: INFM289I.

INST156 How NASA Sees the Earth (3 Credits)
The world of Earth science data is complex and can be overwhelming with a wide range of data sources and formats, hefty downloads and the need for complicated analytical tools. To make use of enormous volumes of available data and geoinformation products, one has to know where and how to search and obtain the data, how to analyze the data, and how to extract useful information and knowledge. In this course, you will learn about the state-of-the-art Web-based tools that allow you to efficiently display and analyze a large number of datasets in a way many professionals working in the Earth science domain would. You will learn how to visualize multiple Earth science datasets produced by NASA in a variety of ways directly on the Internet, without the need to download, manage and store them. Students will be introduced to comprehensive functions to analyze the data and generate customized maps, animations, multi-variable correlations, regional subsetting, etc.
Cross-listed with: GEOG156.
Credit Only Granted for: GEOG156 or INST156.

INST161 Analytics Across Athletics (3 Credits)
Are you passionate about sports and curious how data is transforming the game? This course offers a hands-on introduction to sports analytics through projects, discussions, and guest speakers. You'll explore how data informs athletic performance, strategy, and decision-making while gaining practical skills in organizing, analyzing, and visualizing data. Learn where data comes from--like databases, GPS trackers, and surveys--and how to tell meaningful stories with it. We'll also discuss privacy, consent, ethics, and bias in sports data.

INST201 Introduction to Information Science (3 Credits)
Examining the effects of new information technologies on how we conduct business, interact with friends, and go through our daily lives. Understanding how technical and social factors have influenced the evolution of information society. Evaluating the transformative power of information in education, policy, and entertainment, and the dark side of these changes.
Credit Only Granted for: INST201 or INST301.
Formerly: INST301.

INST204 Designing Fair Systems (3 Credits)
Reviews how specific values are built into different automated decision-making systems as an inevitable result of constructing mechanisms meant to produce specific outcomes. These values create differential outcomes for the different people enmeshed in these systems, but both these values and these systems can be changed to support different values and different outcomes. The class serves as an introduction to the emerging field of algorithmic bias that bridges the disciplines of information science, computer science, law, policy, philosophy, sociology, urban planning, and others.
Credit Only Granted for: INST208D or INST204.
Formerly: INST208D.

INST208 Special Topics in Information Studies (1-6 Credits)
Covers special topics in information studies.
Repeatable to: 9 credits if content differs.

INST210 The Nuts & Bolts of Getting Hired (1 Credit)
Have you thought about finding an internship, getting a job, or starting your career? Perhaps you're confused about how to begin. Welcome to The Nuts and Bolts of Getting Hired, where you'll learn the skills necessary to develop your professional tool kit and obtain the internship or job that can help you build the career you want. This course will help you prepare for the next step in your career by exploring the following topics: Identifying your career goals, mastering the skills of crafting a professional resume, effective interviewing, strategic networking, and professional communication.
Restriction: Must be in the Information Science program, Technology and Information Design program, or Social Data Science program.
Credit Only Granted for: INST208C or INST210.
Formerly: INST208C.

INST227 Fundamentals of Academic Peer Mentoring in Information Studies (1 Credit)
Students will be exposed to scholarship of teaching and learning in support of developing applied skills to support active learning as an iSchool academic peer mentor. Students will learn to effectively coach and support the performance of other people. Guided online and face-to-face participation will culminate in a portfolio of teaching activities and professional development.
Restriction: Permission of the College of Information Studies.

INST228 Academic Peer Mentor Experience in Information Science (1-3 Credits)
Students who are participating in instructional activities for undergraduate courses offered by the College of Information Studies, or by faculty members of the College through other units, can take this course to earn course credit for their AMP work.
Prerequisite: Must have completed or be concurrently enrolled in TLTC333.
Restriction: Permission of INFO-College of Information Studies required.
Repeatable to: 6 credits if content differs.
Formerly: INST208M.

INST232 Health Justice: Investigating the Roles of Information in Preventing & Addressing Health Disparities (3 Credits)
How do we ensure that every individual has the information they need to live a long and healthy life? In this course, we explore health justice - the conviction and enactment of the idea that every person is morally entitled to a fair and sufficient capability to be healthy. We especially focus on the ways in which information-related factors, such as people's access to health information, their strategies for seeking (or avoiding) health information, and their health and digital health literacy, contribute to health (in)justice. Our goal in this class is to promote health justice for all by identifying information-related solutions that will help to facilitate people's access to health information and improve their abilities to find, assess, and make use of information to optimize their own and others' health.
Restriction: Must be a student in the Health Justice Carillon Community.

INST301 Introduction to Information Science (3 Credits)
Examining the effects of new information technologies on how we conduct business, interact with friends, and go through our daily lives. Understanding how technical and social factors have influenced the evolution of information society. Evaluating the transformative power of information in education, policy, and entertainment, and the dark side of these changes.
Restriction: Must be in Information Science program; and restricted to students in the Information Science Program on the Universities at Shady Grove campus.
Credit Only Granted for: INST201 or INST301.

INST308 Education Abroad in Information Studies (1-3 Credits)
Covers special topics in information studies in education abroad settings.
Prerequisite: Minimum grade of C- in MATH115 or higher; minimum grade of C- in INST126; and 1 course with a minimum grade of C- from (PSYC100, SOCY105, BSOS233).
Restriction: Must be in the Information Science program, Technology and Information Design program, or Social Data Science program.
Repeatable to: 9 credits if content differs.

INST309 Independent Study in Information Science (1-3 Credits)
Individual independent study of an aspect of information science, selected according to student interest and need in consultation with a member of the iSchool faculty. Repeatable to 6 credits if content differs.
Prerequisite: Must have completed INST301

INST311 Information Organization (3 Credits)
Examines the theories, concepts, and principles of information, information representation and organization, record structures, description, and classification. Topics to be covered in this course include the methods and strategies to develop systems for storage, organization, and retrieval of information in a variety of organizational and institutional settings, as well as policy, ethical, and social implications of these systems.
Prerequisite: Minimum grade of C- in PSYC100 or SOCY105.
Restriction: Must be in the Information Science program.

INST314 Statistics for Information Science (3 Credits)
Basic concepts in statistics including measure construction, data exploration, hypothesis development, hypothesis testing, pattern identification, and statistical analysis. The course also provides an overview of commonly used data manipulation and analytic tools. Through homework assignments, projects, and in-class activities, you will practice working with these techniques and tools to create information resources that can be used in individual and organizational decision-making and problem-solving.
Prerequisite: Minimum grade of C- in INST126 or GEOG276; and minimum grade of C- in STAT100, and MATH115 (or higher).
Restriction: Must be in Information Science or Social Data Science program.

INST320 Leadership in Collaborative Learning Communities for Information Studies (3 Credits)
This course is the experiential learning component for student leaders selected by the College of Information Studies to facilitate Guided Study Sessions. Student leaders plan and facilitate study sessions that supplement courses by providing additional opportunities to engage with the material. In this course, student leaders will explore and apply evidence-based learning strategies while developing an understanding of how we learn. Throughout this course you will apply principles of teaching and learning, group facilitation, and leadership into the design of your guided study session.
Restriction: Must be in the Information Science, Technology and Information Design, or Social Data Science program; and permission of the INFO College.

INST326 Object-Oriented Programming for Information Science (3 Credits)
An introduction to programming, emphasizing understanding and implementation of applications using object-oriented techniques. Topics to be covered include program design and testing as well as implementation of programs.
Prerequisite: Minimum grade of C- in INST126 or GEOG276.
Restriction: Must be in Information Science or Social Data Science program.

INST327 Database Design and Modeling (3 Credits)
Introduction to databases, the relational model, entity-relationship diagrams, user-oriented database design and normalization, and Structured Query Language (SQL). Through labs, tests, and a project, students develop both theoretical and practical knowledge of relational database systems.
Prerequisite: Minimum grade of C- in INST126, BSOS233, or GEOG276.
Restriction: Must be in Information Science or Social Data Science program.
Credit Only Granted for: INST327 or BMGT402.

INST330 Designing Tools for Tinkering and Learning (3 Credits)
What do kids learn when playing with robots? How can video games teach people? Can people really learn a new language using an app? In this course, we will explore how technologies can help people learn. Central to the class will be looking at different types of tools, technologies, and environments, and investigating the various ways to help people learn. As part of the class students will learn to see the world through the eyes of an educational technology designer and develop ways to create and evaluate technological tools for tinkering and learning. Along the way, we will apply an inclusive user-entered design process to a series of projects, which may include mobile applications, robotics, Internet of Things, toys, and games.
Restriction: Restricted to undergraduate students in the College of Information Studies, or by permission of the instructor.
Credit Only Granted for: INST208Z or INST330.
Formerly: INST208Z.

INST335 Organizations, Management and Teamwork (3 Credits)
Examines principles, methods and types of leadership with an emphasis on goal setting, motivation, problem solving, and conflict resolution. Examines principles of developing teams and managing team projects through planning and execution, including estimating costs, managing risks, scheduling, staff and resource allocation, communication, tracking, and control. Trains students to recognize and capitalize on opportunities to use information to increase efficiency, improve performance, and support innovation within teams and organizations. Focuses on strategic use of emerging technologies and new information resources to execute information-enabled change.
Prerequisite: 1 course with a minimum grade of C- from (INST201, INST301); and minimum grade of C- in PSYC100.
Restriction: Must be in Information Science program.

INST341 Introduction to Digital Curation (3 Credits)
Explores various dimensions and contexts for digital curation, which includes all activities involving the management, representation and preservation of both born-digital and digitized information. Focuses on opportunities, challenges and demands of every-increasing digital data and networked information infrastructure.
Prerequisite: Must have completed with a C- or higher, or be concurrently enrolled in INST311.
Restriction: Must be in Technology and Information Design or Information Science programs.

INST346 Technologies, Infrastructure and Architecture (3 Credits)
Examines the basic concepts of computer hardware, systems software, networking, client/server architectures, cloud computing, distributed systems, and high performance computing as applied to information rich domains. Technology and architectures will be discussed within the contexts of solving social issues, supportingscience, and conducting business operations. Current computing topics such as web environments, IoT, security, management, and policy will also be reviewed.
Prerequisite: Minimum grade of C- from INST201 or INST301; and minimum grade of C- in INST326 and INST327.
Restriction: Must be in the Information Science program; and must have earned a minimum of 60 credits.
Credit Only Granted for: INST346 or BMGT405.

INST347 Cloud Computing for Information Science (3 Credits)
What is cloud computing? Where does cloud computing occur? How can we use cloud computing to solve problems and create opportunities in information science? In this course, the foundations and operation of cloud computing, with a focus on information science applications, will be presented. Key cloud functions such as computing, storage, databases, and networking will be examined. Major cloud providers will be contrasted. The course will conclude with a practical application of cloud services to design and implement a cloud solution to a social, technical, or environmental problem.
Prerequisite: Minimum grade of C- in INST346.
Restriction: Must be in the Information Science major.

INST352 Information User Needs and Assessment (3 Credits)
Focuses on use of information by individuals, including the theories, concepts, and principles of information, information behavior and mental models. Methods for determining information behavior and user needs, including accessibility issues will be examined and strategies for using information technology to support individual users and their specific needs will be explored.
Prerequisite: Minimum grade of C- from INST201 or INST301; and minimum grade of C- in INST311.
Restriction: Must be in Technology and Information Design or Information Science programs.

INST354 Decision-Making for Information Science (3 Credits)
Examines the use of information in organizational and individual decision-making, including the roles of information professionals and information systems in informed decision-making through techniques such as data analysis and regression, optimization, sensitivity analysis, decision trees, risk analysis and business simulation models.
Prerequisite: Minimum grade of C- from INST201 or INST301; and minimum grade of C- in INST314 and PSYC100.
Restriction: Must be in the Information Science program.

INST362 User-Centered Design (3 Credits)
Introduction to human-computer interaction (HCI), with a focus on how HCI connects psychology, information systems, computer science, and human factors. User-centered design and user interface implementation methods discussed include identifying user needs, understanding user behaviors, envisioning interfaces, and utilizing prototyping tools, with an emphasis on incorporating people in the design process from initial field observations to summative usability testing.
Prerequisite: Minimum grade of C- from INST201 or INST301; and minimum grade of C- from PSYC100 or SOCY105; and minimum grade of C- in INST326 and STAT100.
Restriction: Must be in the Information Science program or Technology and Information Design program; and must have earned a minimum of 60 credits.

INST363 Fundamentals of Technology Innovation (3 Credits)
Introduces students to the fundamentals of technology innovation, and how leaders approach innovation in the information science field. The course explores approaches and perspectives on how to develop an individual's capabilities to be better at leading others in an innovative environment. Combining theory and practice, students will be introduced to problem solving and explore ways to become an exceptional innovation leader.
Restriction: Must be in the Technology Innovation Leadership Minor; or permission of INFO-College of Information Studies.
Credit Only Granted for: INST408T or INST363.
Formerly: INST408T.

INST364 Human-Centered Cybersecurity (3 Credits)
Cybersecurity is fundamentally a problem of human interaction with technology, but its technical challenges are better understood than its human challenges. This course is designed to give you an overview of human interactions with cybersecurity technology, from users to system designers. Using the information gleaned in this course, you should be able to make better predictions about how people react to cybersecurity policies and tools, and how those reactions shape organizational behavior. The earlier part of the course focuses on explanations for behavior, while the later parts of the course focus more on the development and evaluation of tools for assisting people in cybersecurity.
Prerequisite: Minimum grade of C- from INST201 or INST301; and minimum grade of C- in INST327, STAT100, MATH115, and PSYC100.
Restriction: Must be in the Information Science program; or must be in the Information Risk Management, Ethics, and Privacy Minor.

INST366 Privacy, Security and Ethics for Big Data (3 Credits)
Evaluates major privacy and security questions raised by big data, Internet of things (IoT), wearables, ubiquitous sensing, social sharing platforms, and other AI-driven systems. Covers history of research ethics and considers how ethical frameworks can and should be applied to digital data.
Prerequisite: Minimum grade of C- in one of the following: INST126, GEOG276, or BSOS233; and minimum grade of C- in STAT100; and minimum grade of C- in one of the following: AASP101, ANTH210, ANTH260, ECON200, ECON201, GEOG202, GVPT170, PSYC100, SOCY100, or SOCY105.
Restriction: Must be in the Information Science, Technology and Information Design, or Social Data Science programs; or must be in the Information Risk Management, Ethics, and Privacy Minor.

INST367 Prototyping and Development Studio (3 Credits)
Covers interaction design--the process of defining products and the broad services built around them--and user experience research--how you determine what to design and how successful your design is. When interacting with systems, people build expectations and mental models of how things work, based upon their previous experience with similar products or processes, and the successful or unsuccessful nature of their interactions determines the success of your design. This course is about how to design for digital interactions that will resonate with your audiences (how the features and functions of a product get translated into something people find usable, useful, and desirable), and the research that goes on throughout that process (from contextual inquiry to evaluating the final product), with a particular emphasis on prototyping and iteration.
Prerequisite: Minimum grade of C- in INST380.
Restriction: Must be in the Technology and Information Design program.
Credit Only Granted for: INST398A or INST367.
Formerly: INST398A.

INST371 Teaching and Learning in Information Studies (3 Credits)
Introduces students to foundational theories and practices of teaching and learning, with an emphasis on how they intersect with ideas from the Information Sciences. Covers foundational theories related to teaching and learning, social and cultural dimensions of learning, designing for learning, evaluating educational technologies, and ways of creating equitable, effective, and accessible learning experiences. Students will design learning activities for others, analyze educational tools and technologies, and explore ways to help teach others about the big ideas of Information Science.
Prerequisite: Minimum grade of C- in INST201; and minimum grade of C- from PSYC100 or SOCY105.
Restriction: Must be in the Information Science program or Technology and Information Design program.

INST377 Dynamic Web Applications (3 Credits)
An exploration of the basic methods and tools for developing dynamic, database-driven websites, including acquiring, installing, and running web servers, database servers, and connectability applications.
Prerequisite: 1 course with a minimum grade of C- from (INST201, INST301, or BSOS233); and minimum grade of C- in INST327, STAT100, and MATH115 (or higher).
Restriction: Restricted to Information Science and Social Data Science.
Credit Only Granted for: INST377 or BMGT406.

INST380 Technology and Information Design: Do Good Now (3 Credits)
Climate change. Poverty. Racism. Pressing social issues are big, complex, and difficult. They can feel overwhelming to understand and impossible to address. You might care deeply about an issue, and want to make a difference, but don't know where to start. Sometimes you might not even try. This course will equip and empower you to delve deep into understanding a social issue of your choosing. Through course materials and activities, you'll try out your changemaker muscles and mindsets. Our goal is that this course will empower you to be an informed, engaged citizen who contributes to your community with and beyond your profession. Along the way, we'll address questions like, "What is social change?" and "What happens when our actions have unintended consequences?" We'll talk about the importance of understanding, empathy, agency, and community, and reflect on how these concepts relate to us as individuals.
Prerequisite: Minimum grade of C- in INST201, INST126, and STAT100; and minimum grade of C- from PSYC100 or SOCY105.
Restriction: Must be in the Technology and Information Design program.
Credit Only Granted for: ARHU380, BSOS388B, PLCY388D, or PLCY380.

INST381 Design Thinking for Visual Communication (3 Credits)
In an age where technology increasingly permeates our daily existence, there remain certain human qualities that machines cannot replicate: creativity, curiosity, and empathy. This course endeavors to delve into the dynamic relationship between the pillars of aesthetics and the core skills of Design Thinking (DT), all with the goal of enhancing the design process. Throughout the course, we will witness instances where DT bolsters Visual Communication (VC), and conversely, where VC lends its support to the DT process. Our exploration will revolve around three pivotal questions: How can we engage users and establish meaningful connections with them? How can we empathize with users' challenges and provide them with effective solutions? How can we embrace a holistic approach to design?
Prerequisite: Minimum grade of C- in PSYC100 or SOCY105; and minimum grade of C- in INST126, INST201, and STAT100.
Restriction: Must be in the Technology and Information Design major.
Credit Only Granted for: INST398J or INST381.
Formerly: INST398J.

INST388 "Maker Movement" Approach to Computing (1 Credit)
Informed by the "maker movement," this course allows students to merge their personal interests and hobbies with computing. This course is great for students new to computing who want to explore real world applications, or for more advanced students wanting an opportunity to engage in depth with a niche topic.
Recommended: C- or higher in INST126 or comparable introductory programming course.
Repeatable to: 3 credits if content differs.

INST389 Supervised Internship in Information Science (1-3 Credits)
Course will provide students with the knowledge, skills, and experiences that will help shape their goals as they begin their successful high-impact Information Career. It will prepare them to work an in an environment in which suitability for high-status positions is not determined by specific skills, but rather by ability to take initiative in complex, dynamic situations. Students must have an internship arranged before enrolling.
Prerequisite: Minimum grade of C- in MATH115 or higher; minimum grade of C- in INST126 or GEOG276; and minimum grade of C- in (PSYC100, SOCY105, or BSOS233).
Restriction: Must be in the Information Science program, Technology and Information Design program, or Social Data Science program.
Repeatable to: 6 credits.

INST398 Special Topics in Information Studies (1-6 Credits)
Selected topics in information studies.
Prerequisite: Minimum grade of C- in STAT100 or MATH115 or higher; and minimum grade of C- in INST126 or GEOG276; and minimum grade of C- in (PSYC100, SOCY105, or BSOS233).
Restriction: Must be in the Information Science program, Technology and Information Design program, or Social Data Science program.
Repeatable to: 9 credits if content differs.

INST401 Design and Human Disability and Aging (3 Credits)
Focuses on the design of consumer products and information systems to enable their use by persons with a wider range of physical, sensory, and cognitive abilities. Overviews aging and major types of impairment as they relate to resulting problems using consumer products and information systems. Focuses on principles of design of mass market products.
Prerequisite: Minimum grade of C- from INST362 or INST367.
Restriction: Must be in Technology and Information Design or Information Science programs.
Credit Only Granted for: INST408B or INST401.
Formerly: INST408B.

INST402 Designing Patient-Centered Technologies (3 Credits)
Companies have created a vast array of apps and other technologies for understanding managing personal health and wellness, but many of them have been created with little understanding of audience needs or potential ethical issues. Course introduces students to the unique challenges of studying people's health and wellness needs as well as designing and evaluating technologies to meet those needs.
Prerequisite: Minimum grade of C- from INST362 or INST367.
Restriction: Must be in Technology and Information Design or Information Science programs.

INST403 Computational Journalism (3 Credits)
Designed to teach the application of computational methods in journalism and reporting. The methods include natural language processing, visualization, and web data mining. The course will also cover the necessity and impact of journalistic ethics in designing computation solutions.
Prerequisite: Permission of the Philip Merrill College of Journalism.
Cross-listed with: JOUR473.
Jointly offered with: JOUR773.
Credit Only Granted for: JOUR479V, JOUR473, INST408I or INST403.
Formerly: JOUR479V and INST408I.

INST405 Game Design (3 Credits)
Games are a structured form of play that are typically undertaken for recreational--but sometimes also educational and even professional--purposes. But what constitutes a successful game? In this course, you will learn the fundamentals of game design: applying elements and principles of game design, such as goals, rules, and challenges to create games, such as board games, card games, and digital games. You will be introduced to the basic tools and methods of game design: paper and digital prototyping, design iteration, design critique, and user testing. As part of the course, you will be designing several games of different types. You will also learn how to use your skills to deconstruct and critique the components of existing games, as well as gain an understanding of the role of the game designer in real-world game development teams.
Prerequisite: Minimum grade of C- in INST126, STAT100 or INST201; and minimum grade of C- from PSYC100 or SOCY105.
Restriction: Must be in the Information Science program or Technology and Information Design program.
Credit Only Granted for: INST408J or INST405.
Formerly: INST408J.

INST406 Cross Disciplinary Design Communication Lab (3 Credits)
Explores the world of communicating the ideas behind the things we make. In design, the product tends to be the prize: a manifestation of experience, sensibilities, and observations. But products do not always articulate a complete picture of what they are and how they came to be. Communication--speaking, writing, depicting, presenting to various audiences--is an under-leveraged component of design, connecting the product with emotion, process, context, and most importantly, the audience.
Prerequisite: Minimum grade of C- in INST380; and a minimum grade of C- in Professional Writing General Education requirement.
Restriction: Must be in the Technology and Information Design program.

INST407 Leading and Sustaining a Culture of Innovation (3 Credits)
Successful leaders know that the key to value creation and sustained growth lies in innovation -- continuously seeking opportunities to create value whether by launching new products and services, entering new markets, or rethinking key processes. This course will focus on the most efficient leadership strategies, change management, team motivation, technology team management for information management within organizations. We will examine some of the best ways to foster innovative behaviors within a team and organization. Students will engage with a course-long culture change challenge.
Restriction: Must be in Technology Innovation Leadership minor; or permission of INFO-College of Information Studies.
Credit Only Granted for: INST408L or INST407.
Formerly: INST408L.

INST408 Special Topics in Information Science (1-6 Credits)
Selected topics in information studies.
Prerequisite: Minimum of a C- from (STAT100, MATH115 or higher); minimum of a C- from (INST126 or GEOG276); minimum of a C- from (PSYC100, SOCY105, or BSOS233).
Restriction: Must be in Information Science, Technology and Information Design, or Social Data Science program.
Repeatable to: 9 credits if content differs.

INST410 Managing with Data and Simulations (3 Credits)
General principles of modeling, data analysis, and decision-making methods. Approaches to evaluating and assessing effective concepts, methods, and procedures of modeling and data analysis for decision making in management, advocacy, and communication situations. Ethical considerations in management, advocacy, and communication situations in professional life.
Prerequisite: Minimum grade of C- in INST126 and STAT100; minimum grade of C- in PSYC100 or SOCY105; minimum grade of C- in INST201 or INST301; and minimum grade of C- in MATH115 or higher.
Restriction: Must be in the Information Science or Technology and Information Design programs.
Credit Only Granted for: INST408M or INST410.
Formerly: INST408M.

INST414 Data Science Techniques (3 Credits)
An exploration of how to extract insights from large-scale datasets. The course will cover the complete analytical funnel from data extraction and cleaning to data analysis and insights interpretation and visualization. The data analysis component will focus on techniques in both supervised and unsupervised learning to extract information from datasets. Topics will include clustering, classification, and regression techniques. Through homework assignments, a project, exams and in-class activities, students will practice working with these techniques and tools to extract relevant information from structured and unstructured data.
Prerequisite: Minimum grade of C- in MATH115 (or higher) and STAT100; and a minimum grade of C- from INST126 or GEOG276; and a minimum grade of C- from one of the following (INST201, INST301, or BSOS233); and a minimum grade of C- from one of the following (AASP101, ANTH210, ANTH260, ECON200, ECON201, GEOG202, GVPT170, PSYC100, or SOCY100); and a minimum grade of C- from BSOS233 or INST314.
Recommended: Minimum C- in MATH140 and (INST326, BSOS326, or GEOG376).
Jointly offered with: SDSI414.
Restriction: Must be in Information Science or Social Data Science program.
Credit Only Granted for: SDSI414 or INST414.

INST420 Data Applications in Global Health (3 Credits)
Explores the impact of data on global health research and practice. Identifies, analyzes and interprets health data on a global scale, and explores the distribution and utilization of data to impact public health outcomes. Topics include machine learning, geospatial analysis, data visualization and data ethics.
Prerequisite: Minimum grade of C- in EPIB315 or INST314; or other upper-level statistics course.
Recommended: GBHL200, SPHL100, or related coursework in global health, medical anthropology, or global politics and development.
Restriction: Must have earned a minimum of 60 credits.

INST422 Modeling and Simulating Systemic Problems (3 Credits)
General principles of systems thinking and feedback dynamics modeling. Approaches, methods, and tools for identifying, articulating, and addressing non-linear, feedback-driven, systemic problems. Approaches to evaluating and assessing systems thinking and feedback dynamics models. Ethical considerations in systems thinking and feedback dynamics modeling practice.
Prerequisite: Minimum grade of a C- in INST201, STAT100, and INST126; and minimum of a C- in PSYC100 or SOCY105.
Restriction: Must be in the Information Science, Technology and Information Design, or Global Health major.

INST423 AI Adoption Clinic: Values-Centered AI for Community Organizations (3 Credits)
Local governments and small organizations are increasingly adopting AI tools--but often without the expertise or resources to evaluate them. This course bridges that gap by giving students hands-on experience supporting real clients through The AI Clinic. Working in teams, students will analyze community "AI cases," assess potential tools, and identify benefits, risks, and ethical implications. Through these projects, students gain practical experience in responsible AI evaluation, procurement, and design for the public good.
Credit Only Granted for: INST423 or INST623.

INST437 Information Architecture (3 Credits)
An introduction to the fundamentals of information architecture and how it's used in the design of digital products and services and in cross-channel service design.
Prerequisite: INST352.

INST441 Digital Curation Ethics and Policy (3 Credits)
Explores via case studies the legal, ethical, and technological challenges in developing and implementing policies for managing digital assets and information. Emphasizes access questions pertinent to managing sensitive information and the roles and responsibilities of information professionals.
Prerequisite: Minimum grade of C- from INST341 or INST380.
Restriction: Must be in the Information Science program or Technology and Information Design program.

INST442 Digital Curation Across Disciplines (3 Credits)
Examines how to apply digital curation principles, tools, and strategies in managing diverse data collections and digital information in different disciplinary settings. Explores differences among data curation principles and practices across diverse settings, ranging from scientific organizations (such as business and academic research laboratories and computational science settings), to humanities-based institutions (such as cultural heritage organizations) to social science-based institutions (such as data-intensive professional environments).
Prerequisite: Must have completed with a C- or higher, or be concurrently enrolled in INST341 or INST380.
Restriction: Must be in the Information Science program or Technology and Information Design program.

INST443 Tools and Methods for Digital Curation (3 Credits)
Introduces students to the application of digital tools and methods in a variety of organizational settings, academic disciplines, and economic sectors.
Prerequisite: Must have completed with a minimum grade of C-, or be concurrently enrolled, in INST341 or INST380.
Restriction: Must be in the Information Science program or Technology and Information Design program.

INST447 Data Sources and Manipulation (3 Credits)
Examines approaches to locating, acquiring, manipulating, and disseminating data. Imperfection, biases, and other problems in data are examined, and methods for identifying and correcting such problems are introduced. The course covers other topics such as automated collection of large data sets, and extracting, transforming, and reformatting a variety of data and file types.
Prerequisite: Minimum grade of C- in STAT100 and INST327; and a minimum grade of C- from one of the following: (INST201, INST301, BSOS233); and a minimum grade of C- from one of the following: (AASP101, ANTH210, ANTH260, ECON200, ECON201, GEOG202, GVPT170, PSYC100, SOCY100, or SOCY105); and a minimum grade of C- from one of the following: (AASP210, ECON230, GEOG306, GVPT201, INST314, PSYC200, or SOCY201); and a minimum grade of C- from one of the following: (BSOS326, INST326).
Restriction: Must be in Information Science or Social Data Science program.

INST450 Introduction to CRM in Salesforce (3 Credits)
Students learn how to configure Salesforce so that they are able to collect, analyze and retrieve all of the vital information associated with their customer base. Moreover, students use Force.com fundamentals to understand Salesforce online application development and the deployment of next-generation cloud apps. The course offers practical hands-on learning that ensures students' job success as well as the theoretical knowledge needed to pass both Salesforce certification exams (ADM201 & Platform App Builder).
Prerequisite: INST327.
Credit Only Granted for: INST408P or INST450.
Formerly: INST408P.

INST451 Consumer Health Informatics (3 Credits)
Explores people's health-related information needs and whether, how, and why people seek out and use (or do not seek out and use) health information and the types of health information they find useful. We will also cover the important and interrelated topics of information avoidance, health behaviors, health literacy, digital health literacy, doctor-patient communication, and patient-to-patient communication through support groups and online communities. Throughout the course, we will also focus on the important concept of health justice - a world in which everyone has an adequate and equitable capability to be healthy.
Prerequisite: Minimum grade of C- in INST126 and STAT100; minimum grade of C- from PSYC100 or SOCY105; and minimum grade of C- from INST201 or INST301.
Restriction: Must be in the Information Science program or Technology and Information Design program.
Credit Only Granted for: INST408A or INST451.
Formerly: INST408A.

INST452 Health Data Analytics (3 Credits)
Health data analytics involves the extrapolation of actionable insights from patient data, using data sources such as electronic health records (EHRs), claims data, surveillance data, and surveys. Health data is complex, often unstructured and incomplete, and is organized for clinical care rather than to meet analytic needs. This course will involve the use of various analytical methods in order to translate large and complex data, whether structured or unstructured, into insights that improve decision-making from both the patient and provider perspectives. Healthcare data are rich and hold so much potential, but a challenge is presented to patients, providers, and even government agencies when it comes to figuring out how to leverage these data. Students in this course will learn foundational topics in data analytics focused on health data and will apply this knowledge to real health datasets through hands-on labs integrated into the lectures.
Prerequisite: Minimum grade of C- in INST126 or GEOG276; and minimum grade of C- in PSYC100 or BSOS233; and minimum grade of C- in STAT100 or MATH115 or higher.
Restriction: Must be in the Information Science program or Social Data Science program.

INST453 Project Management for Information Science (3 Credits)
Provides a comprehensive overview of project management, focusing on the needs of information resources (IR). The course covers the concepts and techniques for planning and execution of projects including developing work breakdown structure, estimating costs, managing risks, scheduling, staff and resource allocation, team building, communication, tracking, control, and other aspects of successful project completion.
Credit Only Granted for: BMGT485, ENCE320, ENCE325, INST408O or INST453.
Formerly: INST408O.

INST454 Project Development Studio (3 Credits)
Allows students to develop a self-selected project or product, such as a game UI system or a task management app, while building advanced design skills. Students bring an initial idea to the class, and through lectures, discussions, weekly critiques, and project milestones, they progress their concepts into tangible, public-facing work. Emphasizing industry-standard methodologies, the course focuses on three core activities: externalizing ideas, engaging in constructive critique, and documenting design decisions and progress. This hands-on approach fosters self-directed learning, collaborative reflection, and a comprehensive understanding of design and development.
Prerequisite: Minimum grade of C- in INST104, INST126, INST204, and INST380; and must have completed or be concurrently enrolled in INST367.
Restriction: Must be in the Technology and Information Design program.

INST455 Information Assurance and Compliance (3 Credits)
Examines the protection of organizational data, personalized information, intellectual property and the associated assurance of the data's transfer, storage and communication. Students will understand how to manage these concerns and respond to both emergent and existing threats within the information domain. We will look at the key principles of Information Assurance, compliance and best practices in the real world.
Credit Only Granted for: INST408U or INST455.
Formerly: INST408U.

INST456 Risk Management Leadership in the Information Age (3 Credits)
Helps students assess and mitigate a range of vulnerabilities within an organization's data networks, allowing them to understand how to protect the integrity, security, and confidentiality of information.
Credit Only Granted for: INST408B or INST456.
Formerly: INST408B.

INST457 Lean startup (3 Credits)
Understanding the innovation process, being a high-performing team member, and having hands-on experience with how to successfully transform an idea into a product or service that people want are critical to launch a business or social enterprise. This skill set is also in high demand by employers. In this class, you will become fluent in lean startup and design thinking principles to experience the entire startup cycle. You'll enjoy hands-on experience with the best practice methods and tools used in global innovation. You'll develop skills to pitch an idea, gain leadership skills to mobilize others, and navigate through difficult teamwork situations. You will benefit from the instructor's decades of experience launching successful for-profit ventures, and will be given an experienced entrepreneur as a mentor, and a lively, hands-on, and experiential style of teaching.
Credit Only Granted for: INST398E or INST457.
Formerly: INST398E.

INST461 Emerging Technologies and Risk Management (3 Credits)
Focuses on how people and companies can achieve various tangible and intangible benefits and assess risk in using and incorporating emerging technologies (i.e. mobile devices, social media, robotic process automation, 3-D printing, cloud computing, blockchain technologies, artificial intelligence, etc.) into the activities and operations of a company.
Credit Only Granted for: INST408Z or INST461.
Formerly: INST408Z.

INST462 Introduction to Data Visualization (3 Credits)
Exploration of the theories, methods, and techniques of visualization of information, including the effects of human perception, the aesthetics of information design, the mechanics of visual display, and the semiotics of iconography.
Prerequisite: Minimum grade of C- in STAT100; minimum grade of a C- from one of the following (INST201, INST301, or BSOS233); minimum grade of C- in INST126 or GEOG276; a minimum grade of C- from one of the following (AASP101, ANTH210, ANTH260, ECON200, ECON201, GEOG202, GVPT170, PSYC100, SOCY100, or SOCY105); and a minimum grade of C- from BSOS233 or INST314.
Restriction: Must be in Information Science or Social Data Science program.

INST463 Technology Socialprenuer (3 Credits)
Introduces students to the role of technology and entrepreneurship in our society. Students will be able to choose an existing society issue and develop creative entrepreneurial ideas to solve it using innovative technologies. The course allows students to meet industry professionals and learn more about various social problems and projects companies focus on and try to solve in the modern world. Students are also able to contribute to those solutions.
Credit Only Granted for: INST398B or INST463.
Formerly: INST398B.

INST464 Decision Making for Cybersecurity (3 Credits)
Discusses human and organizational decision making from a variety of perspectives. Applies different risk assessment and decision making frameworks that are relevant to personal and organization cybersecurity, with a focus on the quantitative Factor Analysis of Information Risk (FAIR) model. Considers monetary, social and societal costs of cybersecurity decisions. Considers a range of questions relating to cybersecurity, from whether to install a game on a smartphone to how to allocate scarce information security resources in an organization.
Prerequisite: Must have earned a minimum grade of C- in INST201, INST126, MATH115, PSYC100, and INST364.
Restriction: Must be in Information Science program.
Credit Only Granted for: INST408W or INST464.
Formerly: INST408W.

INST466 Technology, Culture, and Society (3 Credits)
Individual, cultural, and societal outcomes associated with development of information & communication technologies (ICTs), including pro- and anti-social factors. Unpacking how gender, race, ethnicity, sexual orientation, disabilities, and political affiliations affect consumption and production of online experiences. Unpacking how structures of dominance, power and privilege manifest at individual, institutional and cultural levels.
Prerequisite: Minimum grade of C- in INST201 or INST301; and minimum grade of C- in PSYC100 or SOCY105.
Restriction: Must be in the Information Science program or Technology and Information Design program.

INST467 Fundamentals of Cybersecurity for Policy Makers (3 Credits)
Explores the key issues facing policy makers attempting to manage the problem of cybersecurity from its technical foundations to the domestic and international policy considerations surrounding governance, response, critical infrastructure risk management, and privacy. Designed for students with little to no background in information technology, and will provide the principles to understand the current debates shaping a rapidly evolving security landscape.
Prerequisite: Must have completed with a C- or be concurrently enrolled in INST364.
Restriction: Must be in Information Science program.
Credit Only Granted for: INST408V, PLCY388C, or INST467.
Formerly: INST408V.

INST470 Competitive Business Intelligence (3 Credits)
Competitive intelligence (CI) is a derivative of governmental intelligence, as well as business marketing, economics, and management, that is defined similarly: the collection, evaluation, analysis, and application of legally available information relevant to the plans, decisions, and operations of one's organization. Topics will include an overview and comparison of the intelligence process in government and in business (i.e., the intelligence cycle), a detailed consideration of the requirements and the analytical segments of that process, a survey of current analytical tools, a survey of information sources and information acquisition activities, a survey of required personnel, physical and information security policies, and the necessary efforts in creating an effective CI unit within any business enterprise.
Credit Only Granted for: INST408K or INST470.
Formerly: INST408K.

INST480 Technology Design Ethics (3 Credits)
Recent years have seen increasing attention to technology design ethics: the steps necessary to ensure that technologies support (and don't undermine) human values, human rights, and human flourishing. But what ethical design looks like can vary based on contexts, industries, and individual workplaces. This course will explore, critique, and expand on tools meant to prioritize ethics in technology workplaces. We will experiment with, assess, and then create our own checklists, toolkits, games, and other creative interventions to make ethical conversations central to technology design.
Prerequisite: Must have completed or be concurrently enrolled in INST204.

INST490 Integrated Capstone for Information Science (3 Credits)
The capstone provides a platform for Information Science students where they can apply a subset of the concepts, methods, and tools they learn as part of the Information Science program to addressing an information problem or fulfilling an information need.
Prerequisite: Minimum grade of C- in INST311, INST314, INST326, INST327, INST335, INST346, INST352, and INST362.
Jointly offered with: INST491, SDSI492.
Restriction: Must be in Information Science program; and must have earned a minimum of 90 credits; and permission of INFO-College of Information Studies.
Credit Only Granted for: INST490, INST491, or SDSI492.

INST491 Integrated Capstone for Technology and Information Design (3 Credits)
The capstone provides an opportunity for Technology and Information Design students to integrate and apply the knowledge and skills gained throughout the program. Students will work to address a real-world problem through the design and development of a technology-based solution.
Prerequisite: Minimum grade of C- in INST204, INST367, INST380, INST406, INST454, and INST466.
Jointly offered with: INST490, SDSI492.
Restriction: Must be in the Technology and Information Design program; and must have earned a minimum of 90 credits; and permission of INFO-College of Information Studies.
Credit Only Granted for: INST490, INST491, or SDSI492.

ISRL - Israel Studies

ISRL187 God, Land, Power, and the People: Moral Issues in the Jewish Historical Experience (3 Credits)
Examines the complicated relationship between theology, nationalism, sovereignty, and the ethical exercise of social control using case studies drawn from the Jewish historical experience. The universal and age-old issues implicit in the exercise of power have gained special moral force for Jews with the creation of the State of Israel, a Jewish and a democratic state with substantial non-Jewish minorities and hundreds of thousands of non-citizen subjects. Can these be reconciled? Jewish efforts over the ages and in recent times to define justice provide concrete examples through which to examine and discuss crucial abstract principles.
Cross-listed with: HIST187, JWST187.
Credit Only Granted for: HIST187, JWST187 or ISRL187.

ISRL249 Selected Topics in Israel Studies (3 Credits)
Topics in the study of Zionism and contemporary Israel from the 1880's to the present. Future offerings may address history, politics, or culture.
Recommended: ISRL142.
Repeatable to: 6 credits if content differs.

ISRL256 Zionism and Sexual Revolution (3 Credits)
A study of the changes within European Jewish communities that influenced the development of particular fantasies about and representations of gender, love, and sex in Palestine and Israel. We will investigate the broader intellectual and cultural contexts needed to understand the gender and sexual revolutions of the 19th and 20th centuries, and will examine how European and, later, Israeli Jews adopted and adapted these ideas and cultural forms. We will closely analyze a variety of texts (stories, plays, photographs, and films) and will consider the relationship between ideology and aesthetics.
Cross-listed with: JWST256.
Credit Only Granted for: ISRL249N, JWST219G, ISRL256, or JWST256.
Formerly: ISRL249N or JWST219G.

ISRL269 Special Topics in Study Abroad II (1-6 Credits)
Special topics course taken as part of an approved study abroad program.
Repeatable to: 15 credits if content differs.

ISRL283 The Israeli/Palestinian Conflict: Fundamental Questions (3 Credits)
As has become evident virtually every year, the Palestinian-Israeli conflict retains its capacity to mobilize both sides against each other. Why are Palestinian Arabs and Israeli Jews unable to resolve their differences? This course uncovers some of the deeper explanations as to why the conflict persists, even as it changes over the decades.
Credit Only Granted for: ISRL283 or ISRL289I..
Formerly: ISRL289I.

ISRL289 New Explorations in Israel Studies (3 Credits)
Investigation of critical and innovative responses in Israel Studies. Although the topic will vary, the course will encourage intellectual exploration by students of fundamental problems and critical methods.

ISRL299 Independent Study in Israel Studies (1-3 Credits)
This lower-level independent study allows students to work closely with an Israel Studies faculty member of their choice, pending prior approval of the faculty member. In this independent study, students will focus on a topic specific to Israel Studies.
Prerequisite: Permission of ARHU-Meyerhoff Program & Center for Jewish Studies.
Repeatable to: 6 credits.

ISRL329 Special Topics in Israel Studies (3 Credits)
Topics in the study of Zionism and contemporary Israel from the 1880's to the present at an intermediate level. Individual sections may address history, politics, or culture.
Repeatable to: 9 credits if content differs.

ISRL329G The Israeli Settler Movement: The Road to One State? (3 Credits)
Explores the Israeli settler movement over the last four decades, from its position on the fringes of Israeli society in the 1970s and 1980s to its rise to prominence in Israeli politics today. Topics will include the history of the Israeli settlement project in the West Bank, the emergence of Gush Emunim and its ideological foundations in Jewish messianism, its violent offshoots, and the influence of the settler movement on the Israeli political system. Study of these topics illuminates some of the most important driving forces of modern history such as nationalism, religious fundamentalism, colonialism and the ability of a determined minority to influence a country's policies.
Cross-listed with: JWST332, HIST381.
Credit Only Granted for: HIST329G, HIST381, ISRL329G, JWST332 or JWST319N.
Formerly: JWST319N.

ISRL330 Mizrahi Identity in Israel (3 Credits)
It is impossible to understand Israeli society today without examining the Mizrahi experience. Despite the common misconception that Israel is predominantly made up of Jews from European origin, the fact of the matter is that Jews of Mizrahi origin, whose parents and grandparents immigrated to Israel from the Middle East and North Africa, represent a major part of the Israeli population. Moreover, Ashkenazi-Mizrahi relations continue to be a major source of tension in Israeli politics, and issues of race continue to come up on social media and polarize the Israeli society. This course brings to light narratives of Mizrahi identity in Israel and explores the trajectory of the Mizrahi struggle for equality and against racism through its various milestones: the 1959 Wadi Salib Revolt, the Black Panthers Movement in the 1970s, the emergence of the Israeli Sephardi-Orthodox party Shas, and the new wave of Mizrahi activism in the 21st century.
Cross-listed with: HIST377, JWST334.
Credit Only Granted for: JWST319D, JWST334, HIST377, HIST329Z, ISRL329M, or ISRL330.
Formerly: ISRL329M.

ISRL342 History of Modern Israel (3 Credits)
History of modern Israel since the beginning of the Zionist settlement in 1882. Attention to different interpretations and narratives of Israel's history, including the historical and ideological roots of Zionism, the establishment of the State of Israel, ideological forces, wars, and the triumphs and crises of democracy.Cross-listed with HIST376.
Credit Only Granted for: HIST376 or ISRL342.

ISRL343 Global Migration and the Israeli Case Study (3 Credits)
Over 70% of Israel's population is made of first, second or third generation immigrants, who came from over 70 countries, making Israel an ultimate immigrant society. This course will focus on the history of Israel as a case study for the understanding of the historical phenomena of modern immigration.
Cross-listed with: SOCY398G.
Credit Only Granted for: ISRL349K, GVPT368G, SOCY398G, SOCY398I, or ISRL343.
Formerly: ISRL349K.

ISRL344 The Israeli Settler Movement: The Road to One State? (3 Credits)
Explores the Israeli settler movement over the last four decades, from its position on the fringes of Israeli society in the 1970s and 1980s to its rise to prominence in Israeli politics today. Topics will include the history of the Israeli settlement project in the West Bank, the emergence of Gush Emunim and its ideological foundations in Jewish messianism, its violent offshoots, and the influence of the settler movement on the Israeli political system. Study of these topics illuminates some of the most important driving forces of modern history such as nationalism, religious fundamentalism, colonialism and the ability of a determined minority to influence a country's policies.
Cross-listed with: JWST332, HIST381.
Credit Only Granted for: HIST329G, HIST381, ISRL329G, ISRL344, JWST332 or JWST319N.
Formerly: JWST319N.

ISRL349 Investigating Topics in Israel Studies (3-6 Credits)
Topics in the study of Zionism and contemporary Israel from the 1880's to the present at an intermediate level. Individual sections may address history, politics, or culture.
Recommended: ISRL142 and ISRL249.

ISRL350 The End of the Israel-Arab Conflict?? (3 Credits)
Violence between Jews/Israelis and Arabs/Palestinians on both an inter-communal and inter-state level has been pervasive in the Holy Land for over a century. However, in the past few years, Israel has signed treaties with several Arab countries and more are likely in the near future. Is the larger Israel-Arab conflict ended, or nearly so? This course will examine the last 30 years to understand what has changed about these conflicts and what remains, and then explore different scenarios as to how peace may be possible and what it might look like.

ISRL369 Special Topics in Study Abroad (1-6 Credits)
Special topics course taken as part of an approved study abroad program.
Repeatable to: 15 credits if content differs.

ISRL372 Jewry of Muscle: Zionism and Jewish Masculinity (3 Credits)
Part of the Zionist cultural project involved creating a new Jewish masculinity that would replace the diasporic "sissy Jew" with a strong, healthy new "Jewry of Muscle." Using literary and cinematic sources, we will analyze how these Zionist and Israeli cultural productions served to build (and sometimes undermine) this new model of Jewish masculinity.
Cross-listed with: JWST372.
Credit Only Granted for: JWST319K, ISRL329K, JWST372 or ISRL372.
Formerly: JWST319K or ISRL329K.

ISRL375 Jews and Representations of Race (3 Credits)
Attention to the evolution of Western concepts of "race" from late medieval to modern times requires addressing the meaning of the term "race." How did constructions of Jewish "racial" identities fit into this broader discussion? As Christian Europe's primary minority for centuries, "the Jews" provide evidence for constructions of race as a means of grouping populations culturally and materially. How did Jews interact with the racial discourse of diverse time periods, and how did they negotiate their political realities by both adopting and challenging aspects of the rhetoric of antisemitism as well as the rhetoric of "whiteness" versus "blackness"?
Cross-listed with: JWST375.
Credit Only Granted for: ISRL375, JWST375, ISRL349Z, or JWST319M.
Formerly: ISRL349Z or JWST319M.

ISRL380 Israel: Politics and Society (3 Credits)
Addresses the main issues in Israeli politics and society by focusing on the role of Zionism in the Jewish state, the institutional foundations of Israeli democracy, the main political parties and blocs and their different ideological principles and visions, as well as the main social groups, movements, and institutions that comprise Israeli civil society.
Credit Only Granted for: ISRL329C, ISRL380, or GVPT368D.
Formerly: ISRL329C .

ISRL381 Israeli Foreign and Security Policy (3 Credits)
An overview of Israeli foreign and security policy from 1948 to the present. We will examine how Israel's foreign and security policies reflect its Jewish origins, Zionist ideology, its relations with its neighbors and world powers, and its regional quest for recognition and legitimacy.
Credit Only Granted for: ISRL381, ISRL329P or GVPT368E.
Formerly: ISRL329P.

ISRL382 U.S. Foreign Policy and the Arab-Israeli Conflict (3 Credits)
What are the United States' interests in the Middle East? Who and/or what determines those interests? How are these interests pursued? This course will provide an overview of American diplomacy in the Middle East as it unfolded since the mid-1940s with an emphasis on the Israeli-Arab/Palestinian conflicts. We will first examine the overarching ideational and institutional factors that shape and guide U.S. foreign policy, and then turn to analyze major issues and challenges American diplomacy faces in the Middle East. The course seeks to integrate U.S. foreign policy and the Arab-Israeli conflict into a broader analytical framework dealing with mediation, conflict resolution and management, alliance and politics, and patron-client relations.
Credit Only Granted for: ISRL382, ISRL349F or GVPT368A.
Formerly: ISRL349F.

ISRL383 Political Psychology, Israel, and the Middle East (3 Credits)
What is the role of perceptions and misperceptions in international politics? How do emotions impact policy-making processes? Does social psychology matter when analyzing domestic politics or foreign policy? Political psychology is an interdisciplinary academic field dedicated to the analysis of the nexus between psychological and political processes. This course will identify and employ multiple pertinent political psychology theories to account for Israeli domestic politics and foreign policy as well as other major political events throughout the Middle East including nuclear proliferation, terrorism, and territorial expansionism
Cross-listed with: GVPT368P.
Credit Only Granted for: ISRL329Q, ISRL383 or GVPT368P..
Formerly: ISRL329Q.

ISRL448 Seminar in Israel Studies (3 Credits)
Intensive study of an Israel Studies topic. Expected work product is a substantial research or analysis paper or appropriate equivalent.
Recommended: ISRL349 and ISRL249.
Restriction: Must be in the Israel Studies Minor.

ISRL449 Advanced Topics in Israel Studies (3 Credits)
Topics in the study of Zionism and contemporary Israel from the 1880s to the present at the advanced level. Individual sections may address history, politics, or culture. Some Sections may have language or course prerequisites.
Recommended: ISRL349 or ISRL249.
Repeatable to: 6 credits if content differs.

ISRL499 Advanced Independent Study in Israel Studies (1-3 Credits)
This upper-level independent study allows students to work closely with an Israel Studies faculty member of their choice, pending prior approval of the faculty member. In this independent study, students will focus on a topic specific to Israel Studies.
Prerequisite: Permission of ARHU-Meyerhoff Program & Center for Jewish Studies.
Repeatable to: 6 credits.

ITAL - Italian

ITAL103 Intensive Elementary Italian (4 Credits)
Covers speaking, reading, writing, listening, and culture of Italian-speaking world.
Prerequisite: Must have appropriate World Language Placement (WLP) score.
Restriction: Not open to fluent/native speakers of Italian.
Credit Only Granted for: ITAL103 or ITAL121.

ITAL169 Special Topics in Study Abroad I (1-6 Credits)
Special topics course taken as part of an approved study abroad program.
Repeatable to: 15 credits if content differs.

ITAL203 Intensive Intermediate Italian (4 Credits)
Covers speaking, reading, writing, listening, and culture of Italian-speaking world.
Prerequisite: ITAL103; or must have appropriate World Language Placement (WLP) score.
Restriction: Must not have completed ITAL122; and must not be a fluent/native speaker of Italian.
Credit Only Granted for: ITAL203 or ITAL122.

ITAL204 Advanced Intermediate Italian (3 Credits)
An intensive study of Italian language and culture. This course completes the sequence of ITAL 103 and 203. After a brief review of important material of Intermediate Italian (ITAL 203), we will cover the last four chapters of Parliamo italiano (Unita 9-12). ITAL 204 is designed to reinforce and deepen the students' knowledge of Italian and its idiomatic usage, and to improve their reading and writing skills through a more in-depth study of more complex grammatical forms. Students are encouraged to practice Italian using grammatical concepts in an active manner. There will be oral and written exercises, short readings, and vocabulary expansion. Special attention will be given to readings, oral comprehension and written compositions. To improve their listening and reading comprehension, students will also view and analyze film clips, and read short articles in newspapers and magazines on current events and global issues pertaining to Italy and the European Union.
Prerequisite: ITAL203 or equivalent; or must have appropriate World Language Placement (WLP) score.

ITAL207 Speaking and Writing in Italian (3 Credits)
An intensive upper intermediate language course that focuses on Italian speaking and writing. The course, which is taught entirely in Italian, is designed to reinforce and deepen the students' knowledge of the Italian language and its idiomatic usage, and to improve their speaking ability and listening comprehension. Students will be given practice both in speaking extemporaneously and giving oral reports written on a wide range of topics dealing with contemporary Italy. One of the main objectives of the course is to prepare students to take upper level courses (300-400 levels) in Italian language, literature, and culture
Prerequisite: ITAL204; or students who have taken courses with comparable content may contact the department.
Restriction: Must not be a fluent/native speaker of Italian.

ITAL211 Intermediate Conversation (3 Credits)
Practice in spoken Italian based on reading and listening exercises in a variety of genres. Written assignments and exams.
Prerequisite: ITAL203; or permission of ARHU-School of Languages, Literatures, and Cultures department.
Restriction: Must not be a fluent/native speaker of Italian.

ITAL252 Stories of Italy (3 Credits)
Introduction to fictions across time and space in Italy.
Prerequisite: ITAL207; or permission of ARHU-School of Languages, Literatures, and Cultures department.
Restriction: Must not be a fluent/native speaker of Italian.

ITAL261 Cuisine, Culture, and Society in Italy Yesterday and Today (3 Credits)
Exposes students to an important aspect of Italian culture: the art of gastronomy. Provides an in-depth understanding of the close relationship between food and culture, while enriching their knowledge of the Italian language through reading and analysis of various texts which deal with the preparation and adaptation of Italian food in different cultural settings. Taught in Italian.
Prerequisite: ITAL204; or permission of ARHU-School of Languages, Literatures, and Cultures department.

ITAL269 Special Topics in Study Abroad II (1-6 Credits)
Special topics course taken as part of an approved study abroad program.
Repeatable to: 15 credits if content differs.

ITAL301 Italian Composition (3 Credits)
Techniques of composition; grammatical analysis; various genres; vocabulary.
Prerequisite: ITAL207; or students who have taken courses with comparable content may contact the department.

ITAL306 Commercial Italian I (3 Credits)
An introduction to Italian Business language and culture. Special emphasis on communicative strategies used in business transactions and applications. Reading and discussion of relevant articles relating to business world from on-line newspapers and magazines.
Prerequisite: ITAL301; or permission of ARHU-School of Languages, Literatures, and Cultures department.

ITAL311 Advanced Oral Expression: Current Events (3 Credits)
Oral expression; development of idiomatic forms and vocabulary to level of the Italian press.
Prerequisite: ITAL207; or permission of ARHU-School of Languages, Literatures, and Cultures department.

ITAL361 Survey of Italian Society and Culture: From Fascism to the Seventies (3 Credits)
Development of Italian society and culture from Fascism to the 1970s. Literature, cinema, economy, popular culture, and daily life. Taught in Italian.
Prerequisite: ITAL207.

ITAL362 Survey of Italian Society and Culture: From the 1980s to thePresent Day (3 Credits)
Development of Italian society and culture from the 1980s to the present. Literature, cinema, economy, popular culture, daily life. Taught in Italian.
Prerequisite: ITAL207; or permission of ARHU-School of Languages, Literatures, and Cultures department.

ITAL369 Special Topics in Study Abroad III (1-6 Credits)
Special topics course taken as part of an approved study abroad program.
Repeatable to: 15 credits if content differs.

ITAL386 Experiential Learning (3-6 Credits)
Prerequisite: Must have a Learning Proposal approved by the Office of Experiential Learning Programs, faculty sponsor, and student's internship sponsor.
Restriction: Junior standing or higher.

ITAL388 Language House Colloquium (1 Credit)
The Language House Colloquium is a one-credit course for students residing in the Language House Immersion Program. The course focuses on the further development of skills in the target language and the acquiring of cultural knowledge of the countries that speak the target language. The course is designed to supplement the learning that takes place on a daily basis in the Language House program.
Restriction: Must be a resident in Language House.
Repeatable to: 4 credits.

ITAL399 Directed Study in Italian (1-3 Credits)
Intended for undergraduates who wish to work on an individual basis with a professor of their choice.
Prerequisite: Permission of ARHU-School of Languages, Literatures, and Cultures department.
Repeatable to: 3 credits.

ITAL401 Advanced Composition and Style (3 Credits)
Advanced writing practice in range of genres.
Prerequisite: ITAL301; or students who have taken courses with comparable content may contact the department.

ITAL411 Monsters and Demons: the Faces of Evil in Dante's Inferno (3 Credits)
An interdisciplinary study of Dante's Inferno as represented in the Divine Comedy. Special emphasis on Dante's own portrayal of monsters and demons and their roles in the poet's eschatological vision of Hell.Taught in English

ITAL421 The Italian Renaissance (3 Credits)
A study of major trends of thought in Renaissance literature, art, and science. Taught in English.

ITAL431 Italian Civilization in Translation (3 Credits)
Political, social, intellectual, literary and artistic forces shaping contemporary Italy from the late Middle Ages to the present. Taught in English.

ITAL433 Holocaust in Italian Literature and Cinema (3 Credits)
Review of literature and theoretical writings of Italy's most famous survivor, Primo Levi, to a sampling of Italian films that focus in vastly different and often extremely controversial ways on the experience of the concentration camp, while addressing a series of central questions from the brutal realities of the camps to the "compromises" made in order to survive, the need to bear witness, and the idea of the survivor's guilt.
Cross-listed with: CINE433.
Credit Only Granted for: CINE433, FILM433 or ITAL433.
Formerly: FILM433.

ITAL436 Italian Cinema I: Neorealism (3 Credits)
Explores representations of Italy in cinema with special focus on identity formation and the movement of Italian neorealism and post neorealism. Taught in English.
Cross-listed with: CINE441.
Credit Only Granted for: CINE441, FILM441 or ITAL436.
Formerly: FILM441.

ITAL441 The Dark Side of the Italian Renaissance (3 Credits)
Examines the dark aspects of the Italian Renaissance, focusing on artistic and literary patronage as a strategy of self-promotion and as a means to achieve and preserve power. From the Northern court of Milan to the Southern Kingdom of Naples, we journey through the Italian peninsula, a land that gave birth to illustrious artists and poets in one of the most troubled periods of Italian history, marked by political conflict, bloody rivalries, family betrayals, and wars. What hides beneath the image of some of these benevolent and enlightened patrons of learning, often praised as "ideal rulers" by artists and writers of the Renaissance, are ambitious and crafty politicians, who sought their own interests and goals in their ruthless pursuit of power
Recommended: Some knowledge of Italian at the elementary or intermediate level.

ITAL469 Study Abroad Special Topics IV (1-6 Credits)
Special topics course taken as part of an approved study abroad program.
Repeatable to: 15 credits if content differs.

ITAL471 Italian Cinema: A Cultural Approach in Translation (3 Credits)
The culture of Italy through the medium of film from the silent days up to the present. Taught in English.

ITAL473 Italian Cinema II (In Translation) (3 Credits)
A study of Italian society and culture through the medium of film from the mid 1970's to the present. Taught in English.
Cross-listed with: CINE431.
Credit Only Granted for: ITAL473, CINE431 or FILM431.
Formerly: FILM431.

ITAL475 The Italian Opera Libretto in English (3 Credits)
History and analysis of Italian opera librettos from Monteverdi through Mozart to Verdi and Puccini. Taught in English.
Prerequisite: Must have completed one course in literature.

ITAL478 Colloquium in Italian (1 Credit)
Colloquium section taught in Italian to accompany 400-level Italian courses taught in English. Discussion, presentations, readings.
Prerequisite: ITAL311; or students who have taken courses with comparable content may contact the department.
Corequisite: ITAL498, ITAL411, ITAL431, ITAL421, ITAL473, ITAL475, ITAL471, or ITAL499.
Repeatable to: 6 credits.

ITAL498 Special Topics in Italian Literature (3 Credits)
Repeatable to: 6 credits if content differs.

ITAL499 Special Topics in Italian Studies (3 Credits)
Repeatable to: 6 credits if content differs.

ITAX - Italian Education Abroad

ITAX100 Introduction to Italian Language and Culture (3 Credits)
Open to students with no previous training in Italian, the course introduces features of the Italian language needed for interaction in everyday practical situations, such as the caffe, restaurant, accommodation and in shops. The course satisfies a limited number of immediate needs necessary for survival in the target language culture. Cultural topics, such as Italian gestures, the Italian family, the working world, religion, and women in Italy, will also be studied in order to familiarize the student with certain aspects of contemporary Italian society and culture.
Additional Information: This course is offered as part of the Maryland-in-Rome study abroad program. Students must apply for this program through Education Abroad: More information at ter.ps/UMRome. Education Abroad processes registrations for this course on behalf of students.

ITAX101 Living Perugia: Elementary Language, Culture, and Reflection (4 Credits)
The specific goals of the introductory course is to give students a basic lexicon to interact with everyday life, events and activities of their new host country, while at the same time teaching them the key building blocks of Italian grammar. The central objectives are therefore to provide students with the necessary tools by which they can engage - little by little - with the local community in a meaningful way, and to stimulate students to observe and reflect upon various aspects of the new culture surrounding them.
Credit Only Granted for: ITAL169 or ITAX101.
Formerly: ITAL169.
Additional Information: This course is offered as part of the Maryland-in-Perugia study abroad program. Students must apply for this program through Education Abroad: More information at ter.ps/UMPerugia. Education Abroad processes registrations for this course on behalf of students.

ITAX103 The Florence Experience I (4 Credits)
Students will develop basic cultural and linguistic/communicative competences (speaking, writing, reading and understanding) in Italian through an interdisciplinary experience. Introduces students to various aspects of contemporary Florentine life and Italian culture via field trips, interviews with local Florentines, and cultural activities facilitated by professional directors and playwrights.
Additional Information: This course is offered as part of the Maryland-in-Florence study abroad program. Students must apply for this program through Education Abroad: More information at https://globalmaryland.umd.edu/offices/education-abroad/program/11293. Education Abroad processes registrations for this course on behalf of students.

ITAX110 Introduction To Italian Language and Culture (3 Credits)
Introduces features of the Italian language needed for interaction in everyday practical situations, such as the cafe, restaurant, accommodations and in shops. Equips students with necessary skills for survival in the target language culture. Cultural topics, such as Italian gestures, the Italian family, the working world, religion, and women in Italy, are studied in order to familiarize the student with certain aspects of contemporary Italian society and culture.
Credit Only Granted for: ITAL169R or ITAX110.
Additional Information: This course is offered as part of the Maryland-in-Rome study abroad program. Students must apply for this program through Education Abroad: More information at ter.ps/UMRome. Education Abroad processes registrations for this course on behalf of students.

ITAX201 Cultural Diversity in Italy (3 Credits)
The different practices and experiences of cultural diversity and its challenges in contemporary Italy. The course will analyze the transition of Italy from a country of emigration to a country of both emigration and immigration.
Additional Information: This course is offered as part of the Maryland-in-Rome study abroad program. Students must apply for this program through Education Abroad: More information at ter.ps/UMRome. Education Abroad processes registrations for this course on behalf of students.

ITAX301 Florence: The Story of the City (3 Credits)
Explores how the history of Florence is highly representative of the history of Italy as the cradle of many philosophical, artistic, and political ideas that were key in shaping the Western World. Students in this course will visit both well-known and hidden landscapes of Florence, identify its most celebrated spaces, and understand how the city has changed and how it has been shaped by the character of its people.
Additional Information: This course is offered as part of the Maryland-in-Florence study abroad program. Students must apply for this program through Education Abroad: More information at https://globalmaryland.umd.edu/offices/education-abroad/program/11293. Education Abroad processes registrations for this course on behalf of students.

ITAX302 History of Fashion (3 Credits)
Creativity, a taste for beauty, tradition and imagination have always been part of Italian culture, being key factors in the shaping of its extraordinary artistic heritage, and in the emergence of a specifically Italian style. Students will explore the evolution of Italian Fashion from the fourteenth century through a multi-faceted approach that includes site visits and considers the impact of gender and political structures, Renaissance art, the Florentine silk economy, the emergence of writings on Fashion and style, design experiments connected to the birth of Opera, and Hollywood and Cinecitta industries on clothing, costume, style, and production in our time. Course is taught in English.
Additional Information: This course is offered as part of the Maryland-in-Florence study abroad program. Students must apply for this program through Education Abroad: More information at https://globalmaryland.umd.edu/offices/education-abroad/program/11293. Education Abroad processes registrations for this course on behalf of students.

ITAX304 The History and Culture of Food in Italy (3 Credits)
Explores the history of food in Italy as a gateway to understanding present Italian culture. Students will examine the factors that have shaped Italian food, cuisine, and taste, the variations in eating habits of different socio-economic classes, and the essential role played by food in constructing Italian identities to shed light on fundamental patterns in Italian history and society.
Additional Information: This course is offered as part of the Maryland-in-Perugia study abroad program. Students must apply for this program through Education Abroad: More information at ter.ps/UMPerugia. Education Abroad processes registrations for this course on behalf of students.

IVSP - Individual Studies Program

IVSP317 Progress Report (1 Credit)
A written analysis of the program. Students register for IVSP317 only once, the semester before the final term.
Restriction: Must be in Individual Studies program.

IVSP318 Independent Learning Activities (1-6 Credits)
An independent study course which students can use for a variety of out-of-class internship and research opportunities.
Restriction: Must be in Individual Studies program; and permission of faculty sponsor.
Repeatable to: 9 credits if content differs.

JAPN - Japanese

JAPN101 Elementary Japanese I (6 Credits)
Introduction to basic patterns of contemporary spoken Japanese and to the two phonetic syllabaries (Katakana and Hiragana).
Prerequisite: Must have appropriate World Language Placement (WLP) score.

JAPN102 Elementary Japanese II (6 Credits)
Continued introduction to the basic spoken patterns of contemporary Japanese.
Prerequisite: Minimum grade of C- in JAPN101; or appropriate World Language Placement (WLP) score.

JAPN201 Intermediate Japanese I (6 Credits)
Contemporary spoken and written Japanese.
Prerequisite: Minimum grade of C- in JAPN102; or or appropriate World Language Placement (WLP) score.

JAPN202 Intermediate Japanese II (6 Credits)
Contemporary spoken and written Japanese.
Prerequisite: Minimum grade of C- in JAPN201; or appropriate World Language Placement (WLP) score.

JAPN269 Special Topics in Study Abroad II (1-6 Credits)
Special topics course taken as part of an approved study abroad program.
Repeatable to: 15 credits if content differs.

JAPN298 Special Topics Japanese Literature (3 Credits)
Special topics in Japanese literature.
Repeatable to: 9 credits if content differs.

JAPN301 Advanced Japanese I (6 Credits)
Advanced conversation, oral comprehension, and selected readings.
Prerequisite: Minimum grade of C- in JAPN202; or permission of instructor.

JAPN302 Advanced Japanese II (6 Credits)
Continued readings in varied modern texts and advanced conversation and oral comprehension.
Prerequisite: Minimum grade of C- in JAPN301; or permission of instructor.

JAPN311 Traditional Japanese Language and Culture (3 Credits)
Introduction to classical Japanese language (kobun) through representative texts and genres from the literary traditions of the Heian period (794-1185) to the Early Modern period (1600-1868). Taught in Japanese and English.
Prerequisite: Minimum grade of C- in JAPN202; or permission of instructor.

JAPN315 Reading Japanese Empire (3 Credits)
Reading a wide variety of cultural, intellectual, and official texts, this course explores how Japan's age of empire (1869-1945) was understood, imagined, and lived in various colonial contexts and in the metropolitan center. Students will gain a textured understanding of the complexities and contradictions of Japan's imperial project and the fraught ways this history plays out today in Japan and Asia. Taught in English.

JAPN316 Women and Japanese Literature: Japanese Literature in Translation (3 Credits)
Close critical reading of a range of Japanese literary texts that deal in some significant manner with gender, sex and sexuality. Taught in English.

JAPN325 Modern Japanese Literature and Film (In Translation) (3 Credits)
Explores and questions the significance of some of modern Japan's most dynamic historical transformations, pressing social issues, and modes of cultural expression. Covers the Meiji period (1868-1912) to the 21st century.

JAPN345 Mapping Premodern Japan (3 Credits)
Mapping Premodern Japan investigates travel in Japan through concentrated study of a key route in the premodern period. We will explore the role travel played in larger social, political, economic, and cultural structures and how stories of travel shaped ideas of identity, place, and national culture. We will analyze scholarship, conduct research, and learn the process for developing authentic scholarship in Cultural Studies. The course will culminate in a digital humanities final project in which students will conduct research on the major site of study and present their findings using digital storytelling. Taught in English.

JAPN369 Special Topics in Study Abroad (1-6 Credits)
Special topics course taken as part of an approved study abroad program.
Repeatable to: 15 credits if content differs.

JAPN386 Experiential Learning (3-6 Credits)
Prerequisite: Must have a Learning Proposal approved by the Office of Experiential Learning Programs, faculty sponsor, and student's internship sponsor.
Restriction: Junior standing or higher.

JAPN388 Language House Spring Colloquium (1 Credit)
For students residing in the Language House Immersion Program. Focuses on the development of skills in the target language and acquiring the cultural knowledge of the countries that speak the target language.
Restriction: Must be a resident of Language House.
Repeatable to: 8 credits.

JAPN401 Readings in Modern Japanese Literature (3 Credits)
Development of advanced reading, vocabulary, grammar, and translation skills through selected readings in Japanese drawn primarily from modern literature.
Prerequisite: Minimum grade of C- in JAPN302; or permission of instructor.

JAPN402 Readings in Japanese Cultural Studies (3 Credits)
Development of advanced reading, vocabulary, grammar, and translation skills through selected readings in Japanese drawn from the fields of history, social sciences, cultural studies, film studies, and popular culture.
Prerequisite: Minimum grade of C- in JAPN302; or permission of instructor.

JAPN407 The Art of Translation (3 Credits)
Theory and practice of translation. Variety of genres. Japanese to English.
Prerequisite: 1 course with a minimum grade of C- from (JAPN401, JAPN402); or students who have taken courses with comparable content may contact the department.

JAPN408 Special Topics in Japanese (3 Credits)
Topic in the Study of Japanese, to be announced each time course is offered. Taught in Japanese.
Prerequisite: Minimum grade of C- in JAPN302; or permission of instructor.

JAPN412 Classical Japanese (3 Credits)
Advanced classical Japanese.
Prerequisite: Minimum grade of C- in JAPN311; or permission of instructor.

JAPN418 Japanese Literature in Translation (3 Credits)
Representative works of Japanese literature in translation.
Repeatable to: 9 credits if content differs.

JAPN421 History of the Japanese Language (3 Credits)
Investigation of the origin of the Japanese language, its relationship with other languages, and its development. Taught in English, but presumes knowledge of Kanji (Chinese characters).
Prerequisite: JAPN102; or permission of ARHU-School of Languages, Literatures, and Cultures department.

JAPN424 Japan From the Margins (3 Credits)
Japan from the Margins takes as its focus the history and representations of various others in Japanese society. They include ethnic Ainu, Okinawans, and Koreans, a historical outcaste group called the Burakumin, and people marginalized for their non-normative gender and sexual practices. Students learn about the historical specificities of each group as well as their common experiences of institutional discrimination as they grapple with larger questions regarding prejudice, nationalism, and social justice. Taught in English.

JAPN425 The Atomic Bomb in Literature and Memory (3 Credits)
Study of declassified documents and commentary on the United States decision to use the bomb in 1945, the many ways Japanese writers have attempted to express their indescribable experiences in Hiroshima and Nagasaki, and the shaping of historical narratives and national identities in post-war Japan and the U.S. Taught in English.

JAPN428 Seminar in Japanese Discourse and Conversation Analysis (3 Credits)
Presentation and discussion of classic and current readings in English and Japanese on theories and actual practice of discourse and conversation analysis. Students will learn transcription techniques and have an opportunity to apply them in a final term paper.
Prerequisite: Must have earned a minimum grade of C- in JAPN302.
Repeatable to: 6 credits if content differs.

JAPN438 Topics in Japanese Pragmatics (3 Credits)
Basic concepts in the field of pragmatics (the study of language in context) such as deixis and indexicality, speech acts, ellipsis, and politeness. Readings in English on English and Japanese examples.
Prerequisite: JAPN201.
Recommended: JAPN422.
Repeatable to: 9 credits if content differs. Jointly offered with JAPN638.

JAPN445 Performance and Sexuality in Early Modern Japan (3 Credits)
Explores the intersections between performance and sexuality in early modern Japan. Our main sites will be the stage, the brothels, and everyday life as we examine how people of the period performed gender and sexuality. We will draw from popular fiction, kabuki, puppet theatre, woodblock prints, guides to the pleasure quarters, and censorship edicts. Taught in English.

JAPN447 Technologies of Japanese Performance (3 Credits)
Explores technologies of performance in Japan across the centuries. We will focus on concepts of likeness and liveness as they manifest in performance's mythical origins, the traditions of noh drama, the popular, commercial theatres of kabuki, bunraku, and Takarazuka, and contemporary experiments with robotics, Vocaloids, and other new technologies. Taught in English.
Cross-listed with: THET447.
Credit Only Granted for: THET447 or JAPN447.

JAPN498 Special Topics in Japanese Studies (3 Credits)
Special topics in Japanese studies. Taught in English.

JAPN499 Directed Study in Japanese (1-3 Credits)
Prerequisite: Permission of instructor.
Repeatable to: 6 credits if content differs.

JOUR - Journalism

JOUR130 Self-Presentation in the Age of YouTube (3 Credits)
Students, as they make use of evolving technologies, need to be able to present themselves effectively in front of any number of different audiences through any number of different outlets. Whether in an interview on radio, a guest presentation at a conference, in comments on a video blog, in commentary on TV, in the lead on a self-produced YouTube video, or as spokesperson in front of investors or management, professionals need strong oral communication skills. This class focuses on strengthening those skills through active individual and group presentations, as well as, through discussion of key techniques and group critique of presentation publicly available in the social media space on sites such as YouTube.
Credit Only Granted for: COMM107, COMM200, ENES143, INAG110, JOUR130 or THET285.
Additional Information: May not count toward the Journalism major.

JOUR150 Introduction to Mass Communication (3 Credits)
Survey of the functions and effects of the mass media in the United States. A consumer's introduction to newspapers, television, radio, film, sound recording, books, magazines, and new media technology.
Additional Information: Not applicable toward journalism major.

JOUR152 Introduction to Storytelling with Code (1 Credit)
An introduction to the ways markup and programming languages and computational thinking are transforming news reporting and storytelling.
Prerequisite: Must have completed or be concurrently enrolled in JOUR200.

JOUR175 Media Literacy (3 Credits)
An analysis of the information, values and underlying messages conveyed via television, newspapers, the internet, magazines, radio and film. Examines the accuracy of those messages and explores how media shape views of politics, culture and society.
Additional Information: Not applicable toward journalism major.

JOUR181 Grammar for Journalists (1 Credit)
The basic grammatical structures of standard American written English and its conventions of punctuation, diction and usage in journalistic writing.
Credit Only Granted for: ENGL181, ENGL281, or JOUR181.

JOUR199 Survey Apprenticeship (1 Credit)
College-monitored experience in approved mass-communications organizations and industries.
Prerequisite: Permission of JOUR-Philip Merrill College of Journalism.
Repeatable to: 6 credits if content differs.
Formerly: JOUR198.

JOUR200 Journalism History, Roles and Structures (3 Credits)
Introduction to the study of journalism from the standpoint of media history and sociology.

JOUR201 News Writing and Reporting I (3 Credits)
Introduction to news for the print and electronic media, development of new concepts: laboratory in news-gathering tools and writing skills. Students who earned 80% or higher on the JOUR181 diagnostic are exempt from the JOUR181 prerequisite.
Prerequisite: Minimum grade of C- in ENGL101, JOUR181, and JOUR200; and permission of JOUR-Philip Merrill College of Journalism.
Restriction: For students intending to be journalism majors; and permission of JOUR-Philip Merrill College of Journalism.

JOUR202 News Editing (3 Credits)
Copy editing, fact checking, verification and research across media platforms, including social, with consideration of story play and placement, graphic principles, headlines and SEO.
Prerequisite: JOUR201.
Restriction: Must be in a major in JOUR-Philip Merrill College of Journalism.

JOUR203 Introduction to Multimedia Skills (3 Credits)
Examining the basics of producing and editing digital photos, video, and audio. Topics include: framing, lighting, and other aspects of composition; sequencing, using wide, medium, and tight shots; and ethical considerations when collecting sound and visuals.
Prerequisite: JOUR201.
Restriction: Must be in a major in JOUR-Philip Merrill College of Journalism.
Credit Only Granted for: JOUR203 or JOUR328G.
Formerly: JOUR328G.

JOUR267 Introduction to Social Media and Audience Engagement (3 Credits)
Provides students with an overview of how journalists use social media to gather information, tell stories and reach their target audience. Students will develop skills in social content creation, audience engagement and sourcing and verification.
Credit Only Granted for: JOUR268 or JOUR267.
Formerly: JOUR268.

JOUR281 Media Law and Ethics in the Digital Age (3 Credits)
What are our legal rights and ethical responsibilities as citizens of the digital world? That is the big question we will be exploring this semester. Along the way, you will learn the constitutional foundations of free speech and consider their present-day applications to information gathering and sharing by citizens through social media and online platforms. You will come away with a practical working knowledge of the First Amendment, public access laws, libel, privacy, copyright. You'll develop critical thinking skills for recognizing and dealing with common ethical issues in digital communication.
Credit Only Granted for: JOUR289E or JOUR281.
Formerly: JOUR289E.
Additional Information: This course is intended for non-journalism majors.

JOUR282 Beyond Facebook: How Social Media are Transforming Society, Culture, Business and Politics (3 Credits)
How has social media changed the world, and how has the world changed social media? This course explores how social media has influenced relationships, culture, industry, politics, and the information environment, as well as how significant global events and technological advancements have contributed to the evolution of social media. This course gives students a broad contextual understanding of social media that they may apply in their daily lives as well as future academic inquiry.
Credit Only Granted for: JOUR289F or JOUR282.
Formerly: JOUR289F.

JOUR283 Probing War: Investigative Narratives and American Conflicts (3 Credits)
What role should the American news media play when the United States is at war? Students will explore the realities of war through the work of journalists who pushed beyond the daily headlines, some risking life and limb, to challenge official versions and document uncomfortable realities about American conflicts.
Credit Only Granted for: JOUR283 or JOUR289J.
Formerly: JOUR289J.

JOUR284 Scandal: Exposing Corruption, Justice, and Vice in America (3 Credits)
What are the ingredients of a juicy scandal? Money? Sex? Power? How are scandals uncovered? Why does society punish some scoundrels but not others? Come explore both serious and salacious scandals with a professor who's an expert in both--and who once exposed many scandals himself when he was an investigative reporter. This class examines scandals in politics, science, religion, social media, business, government, sports, and higher education; feeding frenzies, tabloid scandalmongering, undercover reporting, apologies, and cancel culture. Learn why even trivial scandals matter--and how scandals reflect what we value and ultimately who we are.
Credit Only Granted for: JOUR289P, JOUR284 or HONR239J.
Formerly: JOUR289P, HONR239J .

JOUR289I Information 3.0: Exploring Technological Tools (3 Credits)
In a mobile social media world with unlimited amounts of digital information available on demand, what does the future hold for a population that spends hours on their devices seeking, selecting, and sharing more entertaining content than critical information about national and world issues? This course explores innovative ways for producing digital content and engaging diverse audiences with important topics, such as those related to every student's major. Students also utilize new metric tools to answer the question asking how today's digital audiences consume various forms of media and content.

JOUR320 News Writing and Reporting II: Multiplatform (3 Credits)
Principles and practices of news reporting; covering news beats and other news sources, including researching news stories for accuracy, comprehensiveness and interpretation. Due to rigorous publication requirement, plan your schedule accordingly.
Prerequisite: Must have completed or be concurrently enrolled in JOUR152; and minimum grade of C- in JOUR201; and must have completed or be concurrently enrolled in JOUR347 or JOUR370.
Restriction: Must be in a major in JOUR-Philip Merrill College of Journalism.

JOUR325 Capital News Service Bureau (9 Credits)
Advanced journalism training. Students report as part of college's Capital News Service program.
Prerequisite: JOUR320; and permission of JOUR-Philip Merrill College of Journalism.

JOUR327 Urban Affairs Reporting (3 Credits)
Students are immersed in coverage of issues affecting cities, working on a semester-long multi-platform reporting project based in Baltimore.
Prerequisite: JOUR320; and permission of instructor. Jointly offered with JOUR627.
Credit Only Granted for: JOUR327 or JOUR627.

JOUR328 Special Topics in News Writing and Reporting (1-3 Credits)
Advanced training and practice in writing and reporting news.
Repeatable to: 6 credits if content differs.

JOUR334 Audio and Podcast Reporting (3 Credits)
Students will learn the tools needed to report and produce short- and long-form audio storytelling, including writing, reporting, interviewing, production, editing, hosting and delivery. Field reporting and audio gathering outside of class are required, along with writing and mixing broadcast-quality audio stories. Students will work together to produce a complete radio broadcast on deadline, with live and pre-recorded elements. Various interests in audio reporting are welcome and encouraged.
Prerequisite: JOUR360.
Formerly: JOUR368L.

JOUR343 Investigative Reporting (3 Credits)
Students will learn the essentials of accountability reporting while producing a publishable, in-depth project on an issue with national significance and impact on people's lives. Substantial fieldwork, teamwork and persistence are required.
Prerequisite: JOUR320; or must have completed or be concurrently enrolled in JOUR361. And permission of instructor.
Credit Only Granted for: JOUR328I or JOUR343.
Formerly: JOUR328I.

JOUR347 News Videography (3 Credits)
Introduction to shooting, editing and production of video stories for broadcast and the Web; includes newsgathering in the field.
Prerequisite: Must have completed or be concurrently enrolled in JOUR201.
Jointly offered with: JOUR603.
Restriction: Permission of JOUR-Philip Merrill College of Journalism.
Credit Only Granted for: JOUR262, JOUR347 or JOUR603.
Formerly: JOUR262.

JOUR352 Interactive Design and Development (3 Credits)
Conceptualize, wireframe, design and build responsive Web pages using HTML, style sheets and other coding tools; work with open source interactive tools, JavaScript libraries, multimedia and text to create charts, timelines, maps and other forms of nonfiction storytelling.
Prerequisite: JOUR152; and JOUR201; and must have completed or be concurrently enrolled in JOUR347 or JOUR370. Or permission of JOUR-Philip Merrill College of Journalism.
Jointly offered with: JOUR652.
Restriction: Must be in a major in JOUR-Philip Merrill College of Journalism.
Credit Only Granted for: JOUR352 or JOUR652.

JOUR353 News Bureau: Multimedia Reporting (6 Credits)
Advanced reporting and writing in an online environment focusing on multimedia, non-traditional storytelling and investigative reporting.
Prerequisite: JOUR352; and permission of JOUR-Philip Merrill College of Journalism; and (JOUR320 or JOUR360).

JOUR355 News Bureau: Multimedia Editing and Production (6 Credits)
Advanced online journalism training. Students work as multimedia and social media editors and producers, building interactive content and special reports.
Prerequisite: JOUR320 or JOUR360; and JOUR352; and permission of JOUR-Philip Merrill College of Journalism.

JOUR357 Capital News Service Broadcast Immersion (6 Credits)
Advanced broadcast journalism training. Students report as part of the College's Capital News Service program.
Prerequisite: JOUR361; and permission of JOUR-Philip Merrill College of Journalism.

JOUR358 Special Topics in Visual Communication (3 Credits)
Advanced training and practice in visual communication.
Prerequisite: JOUR320 or JOUR360.
Repeatable to: 6 credits if content differs.

JOUR360 News Writing and Reporting II: Broadcast (3 Credits)
Writing and reporting for broadcast media: production of news stories.
Prerequisite: Minimum grade of C- in JOUR201.
Restriction: Must be in a major in JOUR-Philip Merrill College of Journalism.

JOUR361 Television Reporting and Production (3 Credits)
Writing and editing for the broadcast media. Interpretive and documentary news stories.
Prerequisite: JOUR347 and JOUR360.

JOUR362 Broadcast News Producing (3 Credits)
Producing TV news.
Prerequisite: JOUR347 and JOUR360.
Jointly offered with: JOUR662.
Credit Only Granted for: JOUR362 or JOUR662.

JOUR364 Advanced Audio and Podcast Reporting (3 Credits)
Students will receive professional skills training in the reporting, writing, editing, voicing and production of radio news. Students will be required to do extensive field reporting, along with writing and mixing radio pieces. They will also participate in other aspects of radio news production, including editing, directing, live interviewing and hosting. By the end of the semester, students will have created all the elements of a complete radio broadcast. The class will also delve into the history and evolution of radio news and its future in podcasting and other forms.
Prerequisite: JOUR 334.
Jointly offered with: JOUR664.

JOUR367 Broadcast News Bureau (9 Credits)
Advanced broadcast journalism training. Students report as part of the college's Capital News Service program.
Prerequisite: JOUR361; and permission of JOUR-Philip Merrill College of Journalism.

JOUR368 Topics in Broadcast and Electronic Media (1-3 Credits)
Advanced research, analysis and/or practice of selected topics in broadcast journalism.
Repeatable to: 6 credits if content differs.

JOUR370 Photojournalism (3 Credits)
Examining the basics of shooting, editing and storytelling with still photos taken with 35mm digital cameras. Students shoot portraits, feature photos and action shots. Final project is a photo story/essay.
Prerequisite: Must have completed or be concurrently enrolled in JOUR201.
Restriction: Permission of JOUR-Philip Merrill College of Journalism.
Credit Only Granted for: JOUR370 or JOUR670.
Additional Information: Students are required to borrow, rent or purchase a 35mm digital camera. Contact department for camera specifications.

JOUR371 Feature Writing (3 Credits)
Research and writing feature articles.
Prerequisite: JOUR320.

JOUR382 Sports Reporting and Writing (3 Credits)
Gives students full and wide-ranging instruction in all aspects of sports reporting and writing, including how to report, write, edit and lay out sports stories, incorporating photography and multimedia. We will also discuss ethics, objectivity, fairness and the future of sports journalism.
Prerequisite: JOUR320; and permission of JOUR-Philip Merrill College of Journalism.
Jointly offered with: JOUR682.
Credit Only Granted for: JOUR382 or JOUR682.

JOUR383 Advanced Photojournalism (3 Credits)
Provides a deeper dive into the storytelling medium of photojournalism. Students will learn the skills necessary to tell in-depth, long-term stories through the use of still photography. Topics of discussion will include the history of photojournalism, changing approaches to the photo story/essay, how to approach a variety of potential subjects and situations, finding long-term photo story projects and organizing images for a variety of digital and traditional formats.
Prerequisite: JOUR370.
Restriction: Permission of Philip Merrill College of Journalism.
Credit Only Granted for: JOUR368N or JOUR383 .
Formerly: JOUR368N.

JOUR384 Social Media Content Creation, Audience Engagement and Analytics (3 Credits)
Provides students with an overview of social media best practices for journalists and will work to develop their skills in social content creation, audience engagement, sourcing and verification and analytics. By the end of this course, students will have the practical skills needed to manage a social media account for themselves or to contribute to the management of a news organization's social media presence.
Prerequisite: JOUR320 or JOUR360.
Jointly offered with: JOUR657.
Credit Only Granted for: JOUR368D or JOUR384 .
Formerly: JOUR368D.

JOUR388 Supervised Sports Communication Internship (1-3 Credits)
This course is designed to give students who have been offered media internships with sports teams and media companies the opportunity to receive degree credit for their work. The internship would allow them to acquire skills and apply classroom training in a professional setting under guidance of a company supervisor.
Prerequisite: Minimum grade of C- in JOUR201.
Restriction: Must have permission of the College of Journalism.
Repeatable to: 3 credits.
Additional Information: This will not replace the JOUR396 journalism internship course required for majors. It is instead an opportunity for students to explore other career paths that their degree prepares them for.

JOUR389 News Coverage of Special Topics (1-3 Credits)
Advanced training and practice in writing and reporting news in one specialized field of interest.
Repeatable to: 6 credits.

JOUR396 Supervised Internship (2 Credits)
Students will complete a minimum of 90 hours in a supervised journalism internship over a minimum of 10 weeks in spring and fall, and eight weeks in summer. Emphasis is on relating academic training to professional experience. To enroll, students must do the following: Fill out the internship proposal form, have their internship supervisor fill it out, and meet with the college's internship director to receive permission to register. No requests to register after the Schedule Adjustment Period will be granted.
Prerequisite: Must have earned a grade of C- or better in JOUR201.
Restriction: Must be a major in the JOUR-Philip Merrill College of Journalism.
Credit Only Granted for: JOUR326, JOUR366, or JOUR396.

JOUR398 Independent Study (1-3 Credits)
Individual projects in journalism.
Repeatable to: 3 credits.

JOUR399 Supervised Internship (1 Credit)
Supervised news internship experience; relation of academic training to professional experience.
Prerequisite: Minimum grade of C- in JOUR320 and JOUR360.
Repeatable to: 3 credits if content differs.
Credit Only Granted for: JOUR326, JOUR366, JOUR396, or JOUR399.

JOUR402 Journalism Law and Ethics (3 Credits)
An examination of the legal rights and ethical problems and constraints of mass media, including libel, privacy, copyright, monopoly and contempt.
Prerequisite: JOUR201.
Credit Only Granted for: JOUR402 OR JOUR400 and JOUR300.

JOUR405 Breaking News With Numbers: Statistics for Journalists (3 Credits)
Common statistical tools, software and data visualization techniques will be used to allow students to analyze data and solve problems relevant to reporting and writing about politics, sports, criminal justice, business and other fields.
Prerequisite: Minimum grade of C- in JOUR201; and (MATH107 or MATH110; or must have completed a higher level math course).
Restriction: Must be in a major in JOUR-Philip Merrill College of Journalism.

JOUR434 Salzburg Seminar: Global Media Literacy (3 Credits)
An advanced analysis of the information, values underlying messages conveyed via television, newspapers, the Internet, magazines, radio and film from a cross-cultural perspective. Examines the accuracy of messages and explores how distinctive global media shape views of politics culture and society with nations, across regions and internationally.
Restriction: Must be in Salzburg Academy program. Jointly offered with JOUR734.
Credit Only Granted for: JOUR434 or JOUR734.

JOUR435 Salzburg Seminar: Global Change, Global Cooperation (3 Credits)
Practical and theoretical examination of a global problem (or problems) of contemporary importance from a cross-cultural, perspective. Analytical framework used to examine how media shape global problems, events and/or issues regionally.
Restriction: Must be in Salzburg Academy program. Jointly offered with JOUR735.
Credit Only Granted for: JOUR435 or JOUR735.

JOUR443 Sports, Society, Culture and the Media (3 Credits)
Designed to explore how sports, society, culture and the media critically relate to each other and the vast audiences of fans and interested parties. Students will study how journalists impact change; how sports shape culture; and how sports are seen throughout the world. College sports, children and sports, the business of sports, the history of sports media and the future of sports in society will be studied as well.
Restriction: Junior standing or higher.
Credit Only Granted for: JOUR459G or JOUR443.
Formerly: JOUR459G.

JOUR447 Sports, Protest and the Media (3 Credits)
Addresses why activists, whether athletes or not, have long commanded ceremonial and ritualistic games to promote a cause or take a stand. It examines the important role of media as collectors, editors, interpreters and disseminators of information or news about athletic competitions, athletes and political pronouncements revolving around athletic events and their participants.
Credit Only Granted for: JOUR447 or JOUR458M.
Formerly: JOUR458M.

JOUR451 Advertising and Society (3 Credits)
Advertising as an institution with manifest economic purposes and latent social effects. Influences of advertising on people, and related issues of ethics and social responsibility.
Restriction: Junior standing or higher.

JOUR452 Women in the Media (3 Credits)
Participation and portrayal of women in the mass media from colonial to contemporary times.
Cross-listed with: WGSS452.
Credit Only Granted for: JOUR452, WMST452 or WGSS452.
Formerly: WMST 452.

JOUR453 Media Coverage of Diversity (3 Credits)
Analysis of media coverage of issues relating to diversity in the United States, with special attention to race, ethnicity, class, gender, sexual orientation and religious affiliation.
Restriction: Junior standing or higher.

JOUR455 Media Entrepreneurship (3 Credits)
Basic business and entrepreneurship concepts will be covered and will explore how technology is transforming the business of media. Students develop and pitch ideas for media businesses, learn startup basics, do exercises in Internet advertising and business plan analysis, use social networks and other digital communication tools, and perform other hands-on exercises in business development and presentation.

JOUR456 Literature in Journalism (3 Credits)
From Truman Capote's In Cold Blood to Mark Bowden's Black Hawk Down, students will examine how literary works can help writers approach a subject in a different way than more traditional forms of journalism, including the advantages and limitations of the style.
Credit Only Granted for: JOUR456 or JOUR673.

JOUR458 Special Topics in Journalism (3 Credits)
Issues of special concerns and current interest.
Repeatable to: 6 credits if content differs.

JOUR459 Special Topics in Journalism (1-3 Credits)
Issues of special concern and current interest. Open to all students.
Repeatable to: 6 credits if content differs.

JOUR471 Follow the Money: Reporting on Business (3 Credits)
Business and economics reporting is one of the strongest sectors of journalism with lucrative employment opportunities. This class, designed for journalism and non-journalism majors, introduces students to the main economic and business themes that dominate news coverage. Topics will include: corporate money and power in Washington, the ups and downs of the stock market, rising income inequality, the immigration crisis, why we have a trade war with China and technology disruptors. This class will be helpful to students who want to enhance their career opportunities by understanding how the economy works, why globalization is important and how the biggest corporations--including technology companies--have such a big influence on the way we live.
Restriction: Must have permission of the College of Journalism.
Credit Only Granted for: JOUR479C or JOUR471.
Formerly: JOUR479C.

JOUR472 Data Journalism (3 Credits)
A practical, skills-based course in the basics of modern data journalism, data literacy and data storytelling. Students will learn to use data visualization, data analysis and other data-driven reporting techniques.
Prerequisite: JOUR320 or JOUR360.
Jointly offered with: JOUR772.
Credit Only Granted for: JOUR472 or JOUR772.

JOUR473 Computational Journalism (3 Credits)
Designed to teach the application of computational methods in journalism and reporting. The methods include natural language processing, visualization, and web data mining. The course will also cover the necessity and impact of journalistic ethics in designing computation solutions.
Prerequisite: Permission of the Philip Merrill College of Journalism.
Cross-listed with: INST403.
Jointly offered with: JOUR773.
Credit Only Granted for: JOUR479V, JOUR473, INST408I or INST403.
Formerly: JOUR479V and INST408I.

JOUR475 Understanding Audiences and Analytics (3 Credits)
As journalism evolves, it may be more important than ever to understand what were once simply called "audiences" -- who they are, how they consume news, and what that engagement means for them and for society. Students will learn to think critically about news audiences and contemporary issues in audience research.
Prerequisite: Student must have completed a university statistics course.
Credit Only Granted for: JOUR479O or JOUR475.
Formerly: JOUR479O.

JOUR476 Researching Emerging Media in Journalism: Past, Present and Future (3 Credits)
Students will examine developments billed as innovative in the current technology-laden news ecology -- such as social media, mobile reporting and virtual reality -- and the blurring of lines between hard news, informed opinion and advocacy. While questions about the future cannot be answered with any certainty, an exploration of the past allows us to see what happened when new technologies, information systems and practices appeared as possible tools for use by journalists and the communities they served. Students will learn to use resources for researching emerging media, including UMD library databases and open access sources. The course will include presentations by the instructor, discussions, field trips, in-class exercises and student presentations. Each student will engage in a research project to understand the experience of emerging media in a decade between 1820 and 1980. Students will also write an essay contemplating current trends and the future of emerging media.
Prerequisite: Must have completed a university statistics course.

JOUR479 Special Topics in Data Gathering and Analysis (1-3 Credits)
Special research topics for reporting and writing.
Repeatable to: 3 credits.

JOUR480 Capstone Colloquium: The Business of News (1 Credit)
Students will learn the basic news business concepts and examine how revenue and cost structures for media businesses are evolving in new directions. Topics include basic principles and concepts that drive media businesses in the Internet age, including revenue sources, dynamics of online advertising and subscriptions, mobile media strategies, user metrics, engaging audiences, and market dynamics.
Restriction: Must be in a major in JOUR-Philip Merrill College of Journalism; and junior standing or higher; and permission of JOUR-Philip Merrill College of Journalism.

JWST - Jewish Studies

JWST141 American Jewish Experience (3 Credits)
History of the Jews in America from Colonial times to the present. Emphasis on the waves of migration from Germany and Eastern Europe; the changing nature of the American Jewish community and its participation in American social, economic, and political life.
Cross-listed with: HIST106.
Credit Only Granted for: HIST106 or JWST141.

JWST171 Is Judaism a Religion? (3 Credits)
Jewish identity can be framed in terms of ethnicity, culture, and religious practice, but also in terms of more contemporary social constructions including social action, political engagement, and intellectual pursuit. In the context of such diverse social and individual frames, what does it mean to identify Judaism as a religion? Attention to Jewish society in historical and global perspective will provide a backdrop for a particular focus on contemporary Jews in the United States and Israel.
Cross-listed with: RELS171.
Credit Only Granted for: JWST171 or RELS171.

JWST187 God, Land, Power, and the People: Moral Issues in the Jewish Historical Experience (3 Credits)
Examines the complicated relationship between theology, nationalism, sovereignty, and the ethical exercise of social control using case studies drawn from the Jewish historical experience. The universal and age-old issues implicit in the exercise of power have gained special moral force for Jews with the creation of the State of Israel, a Jewish and a democratic state with substantial non-Jewish minorities and hundreds of thousands of non-citizen subjects. Can these be reconciled? Jewish efforts over the ages and in recent times to define justice provide concrete examples through which to examine and discuss crucial abstract principles.
Cross-listed with: HIST187, ISRL187.
Credit Only Granted for: HIST187, JWST187 or ISRL187.

JWST219 Special Topics in Jewish Studies (3 Credits)
Repeatable to: 9 credits if content differs.

JWST225 Religions of the Ancient Near East (3 Credits)
Introduction to ancient Near Eastern religious systems and mythology, from the third millennium BCE through the fourth century BCE. Particular emphasis on Mesopotamia and ancient Israel.
Cross-listed with: RELS225, HIST219I.
Credit Only Granted for: JWST225, HIST219I, RELS225, or RELS219A.
Formerly: RELS219A.

JWST230 Inventing Traditions: The Making of Rabbinic Judaism (3 Credits)
Introduces the dramatic literary and cultural (as well as political and demographic) innovations that reshaped Judaism in late antiquity. Examines the fundamental works and genres of rabbinic literature and the religious movement that produced them. Special emphasis on the rabbinic uses of "tradition" to enhance authority and legitimacy, and to foster group identity.
Cross-listed with: HIST281, RELS230.
Credit Only Granted for: HIST281, JWST230, RELS219C or RELS230.
Formerly: RELS219C.

JWST231 Jewish Texts and Cultures of the Second Temple Period (3 Credits)
An introduction to the literature, history, and culture of Jews in the period between the sixth century BCE and the second century CE. Special topics may include the rise of the formation of the biblical canon, scriptural interpretation, sectarian and revolutionary movements, and growth of the diaspora.
Cross-listed with: HIST291.
Credit Only Granted for: HIST291 or JWST231.

JWST233 Why the Jews? Historical and Cultural Investigations (3 Credits)
Examines the history and culture of the Jews from the thirteenth century BCE/BC to the present through an examination of significant themes or problems (such as "religion" or "diaspora") that shape our understanding of the Jewish people. A primary focus in the course will be on texts, artifacts, and other cultural products by Jews and others that illustrate the history of the Jews help understand their cultural heritage.
Restriction: Must not have completed HIST282, HIST283, JWST234, or JWST235. Cross-listed with HIST287.
Credit Only Granted for: JWST233 or HIST287.

JWST235 History of the Jewish People II (3 Credits)
Political, economic, social and cultural development within Jewish history from the end of the Middle Ages to the present. Special attention to the twentieth century developments including the Nazi Holocaust and its aftermath, the Zionist movement and the creation of the State of Israel, and the rise of the contemporary American-Jewish community.
Credit Only Granted for: HIST283, HIST283H, JWST235, or JWST235H.

JWST250 Fundamental Concepts of Judaism (3 Credits)
A conceptional introduction to Judaism, analyzing its fundamental concepts from both analytical and historical perspectives. Discussion of "normative" Judaism as well as other conceptions of Judaism. Topics include: God, the Jewish people, authority, ethics, the sacred and the profane, particularism and universalism.
Cross-listed with: PHIL234, RELS250.
Credit Only Granted for: JWST250, PHIL234, or RELS250.

JWST256 Zionism and Sexual Revolution (3 Credits)
A study of the changes within European Jewish communities that influenced the development of particular fantasies about and representations of gender, love, and sex in Palestine and Israel. We will investigate the broader intellectual and cultural contexts needed to understand the gender and sexual revolutions of the 19th and 20th centuries, and will examine how European and, later, Israeli Jews adopted and adapted these ideas and cultural forms. We will closely analyze a variety of texts (stories, plays, photographs, and films) and will consider the relationship between ideology and aesthetics.
Cross-listed with: ISRL256.
Credit Only Granted for: ISRL249N, JWST219G, ISRL256, or JWST256.
Formerly: ISRL249N or JWST219G.

JWST262 Introduction to the Hebrew Bible/Old Testament (3 Credits)
Origins of the Hebrew Bible (Old Testament), with attention to literary formations, archaeology, and social-political settings. Explorations of major questions, including who wrote the Bible, and when; relationships of the biblical tradition to the mythology and religious structures of ancient Israel's near eastern neighbors; and dynamics of politics, religious leadership, and law.
Cross-listed with: ENGL262, HEBR298B.
Credit Only Granted for: JWST262, HEBR298B, or ENGL262.

JWST269 Special Topics in Study Abroad II (1-6 Credits)
Special topics course taken as part of an approved study abroad program.
Repeatable to: 15 credits if content differs.

JWST272 Diversify and Multiply: Jewish Culture and the Production of an Identity (3 Credits)
Provides students with a unique exploration of cultural products produced by a diverse array of Jewish creators of literature, comedy and film. The texts, films, and performing arts touch on the central social, economic, and cultural issues of Jews during the ages, and up to the 21st century. This course will explore Jewish creativity throughout history, as well as the Jewish encounter with modernity as a whole. We will be diving into prominent creators such as Tiffany Haddish, Larry David, Sholem Aleichem, Adam Sandler, S. Y. Abramovitsch, Judd Apatow, Philip Roth, Amy Schumer, I. B. Singer, Ben Stiller, Franz Kafka, Dan Levy, and others. Examining their creations will open a window to the diverse methods of construction of modern Jewish identities.
Cross-listed with: CMLT242.
Credit Only Granted for: JWST272, CMLT242, or ISRL249G.

JWST274 Jerusalem in Antiquity: The History of Sacred Space in a Holy City (3 Credits)
Examines the complex history of Jerusalem's status as a holy city, with a focus on constructions of sacred space in Judaism, Christianity, and Islam.
Cross-listed with: RELS274.
Credit Only Granted for: JWST274, RELS274, JWST289J or RELS289J.
Formerly: JWST289J, RELS289J.

JWST275 Urban Dreams and Nightmares: The Jewish Experience of Cities (3 Credits)
Cities give expression to man's power while they highlight human limitations. It is urban social diversity that makes great wealth and thriving culture possible, but it also fixes discrimination behind walls constructed from paper and stone. Nations make cities symbols of the sacred and the glorious, while they ignore the poverty and social alienation that city life breeds. Jews, intensively urbanized for millennia, provide a special vantage point from which to study the beauty and the tragedy implicit in city-building. Our sources will include the Bible, poems, plays and novels but also US Supreme Court rulings and news of riots in Israel. We will survey how Jews have shaped, and been shaped by, the urban challenge over time and space.
Cross-listed with: HIST286.
Credit Only Granted for: HIST286 or JWST275.

JWST281 Yiddish I (3 Credits)
Introduction to the Yiddish language, with emphasis on speaking, reading, and writing skills. Students will also learn the history of the language, its significance to Jewish culture, its origins and basic structure.
Cross-listed with: GERS141.
Credit Only Granted for: JWST281, GERM148Y or GERS141.

JWST282 Yiddish II (3 Credits)
Introduction to the Yiddish language, with emphasis on speaking, reading, and writing skills. Students will also learn the history of the language, its significance to Jewish culture, its origins and basic structure.
Prerequisite: JWST281; or permission of ARHU-Meyerhoff Program & Center for Jewish Studies.
Cross-listed with: GERS142.
Credit Only Granted for: GERM149Z, GERS142 or JWST282.

JWST285 Jewish Languages in America (3 Credits)
With a particular focus on language minority intra-group relationships -- the convergences, divergences, feelings of solidarity and tensions of difference within the group--this course will examine the history, current functional use and identity implications of Jewish languages in the United States.
Cross-listed with: HEBR298O.
Credit Only Granted for: JWST285, JWST219O or HEBR298O.
Formerly: JWST219O.

JWST289 New Explorations in Jewish Studies (3 Credits)
Investigation of critical and innovative responses in Jewish Studies. Although the topic will vary, the course will encourage intellectual exploration by students of fundamental problems and critical methods.

JWST289E Civil Discourse or Urban Riot: Why Cities Don't (Often) Explode (3 Credits)
An examination of the mechanisms that promote peaceful co-existence in urban societies and a discussion of how and why city streets sometimes become violent.
Cross-listed with: HIST135.
Credit Only Granted for: HIST135 or JWST289E.

JWST290 Can Jews be Arabs? Identity and Crisis for the Jews of Arab Lands in Modern Times (3 Credits)
For centuries, Jews inhabited the Islamic lands of the Middle East and North Africa. Their population has dropped from nearly one million a century ago to several tens of thousands today, mostly in Turkey and Iran. The vibrant and ancient Jewish communities of Iraq, Egypt, Syria, Morocco, Algeria, Libya, and several other countries were practically gone by 1970. One popular explanation for this exodus is that an "age-old schism between Jews and Muslims," in the words of the prominent historian Martin Gilbert, drove Jewish men and women to leave their historic homelands in the years following the first Arab-Israeli war of 1948. However, recent research into these communities offers a more complex picture of their lives in Islamic lands in the 19th and 20th centuries and subsequent departure.
Cross-listed with: HIST290.
Credit Only Granted for: JWST289A, HIST219C or HIST290.

JWST298 Elementary/Introductory Language Module for Jewish Studies (1-3 Credits)
A supplementary language module for students enrolled in designated Jewish Studies classes. Language of instruction English, texts in original language.
Prerequisite: HEBR212 or JWST282; or permission of ARHU-Meyerhoff Program & Center for Jewish Studies.
Repeatable to: 9 credits if content differs.

JWST299 Independent Study in Jewish Studies (1-3 Credits)
This lower-level independent study allows students in to work closely with a Jewish Studies faculty member of their choice, pending the prior approval of the faculty member. In this independent study, students will focus on a topic specific to Jewish Studies.
Prerequisite: Permission of ARHU-Meyerhoff Program & Center for Jewish Studies.
Repeatable to: 6 credits if content differs.

JWST304 Critical Approaches to Israeli Culture (3 Credits)
An examination of the intersections of literature, society, philosophy, and politics in the making of modern Israeli culture. Special attention will be paid to the Zionist emphasis on making "new" Jews and its implications when expressed in literature and society.
Formerly: JWST419B and JWST419K.

JWST314 Pedagogy and Instruction in the Hebrew Classroom (3 Credits)
An exploration of applied linguistic theory and issues in Hebrew teaching to current and future Hebrew and Judaic studies teachers. First and second language acquisition theories, past and present language teaching methodologies, effective approaches to teaching and testing in the four skill areas (listening, speaking, reading, and writing), as well as knowledge of the role of identity, context, and affective factors in Hebrew language learning. Taught in English.
Credit Only Granted for: JWST314, JWST419F, or JWST429C.
Formerly: JWST419F and JWST429C.

JWST315 Culture and Identity in Jewish and Hebrew Education (3 Credits)
An in-depth examination of heterogeneous natures of various language learning settings. Social and psychological theories of second language and identity acquisition, anomie and language/identity attrition, and conflicts of class, religion, ethnicity, and power relations that affect Jewish and Hebrew education. Taught in English.
Credit Only Granted for: JWST429P or JWST315.
Formerly: JWST429P.

JWST319 Special Topics in Jewish Studies (1-6 Credits)
Topics in Jewish Studies.
Repeatable to: 12 credits if content differs.

JWST319D Mizrahi Identity in Israel (3 Credits)
It is impossible to understand Israeli society today without examining the Mizrahi experience. Despite the common misconception that Israel is predominantly made up of Jews from European origin, the fact of the matter is that Jews of Mizrahi origin, whose parents and grandparents immigrated to Israel from the Middle East and North Africa, represent a major part of the Israeli population. Moreover, Ashkenazi-Mizrahi relations continue to be a major source of tension in Israeli politics, and issues of race continue to come up on social media and polarize the Israeli society. This course brings to light narratives of Mizrahi identity in Israel and explores the trajectory of the Mizrahi struggle for equality and against racism through its various milestones: the 1959 Wadi Salib Revolt, the Black Panthers Movement in the 1970s, the emergence of the Israeli Sephardi-Orthodox party Shas, and the new wave of Mizrahi activism in the 21st century.
Cross-listed with: ISRL330, HIST377.
Credit Only Granted for: JWST319D, HIST377, HIST329Z, ISRL329M, or ISRL330.
Formerly: ISRL329M.

JWST319P Arts & Humanities in Social Innovation, Change, and Justice: Do Good Now (3 Credits)
The course serves as the core course for the Arts-and-Humanities track in PLCY's minor in "Nonprofit Leadership and Social Innovation." Students will be introduced to the role that the Arts and Humanities can play in social innovation and social change, while exploring various mechanisms for achieving impact with a focus on advancing social justice, equity and systems change. This course deepens understandings of nonprofit leadership, entrepreneurship and social innovation by guiding students through the creation and implementation of social change projects and ventures of their choice.
Cross-listed with: ARHU380.
Credit Only Granted for: ARHU380, BSOS388B, JWST319P, or PLCY388D.

JWST319Y Archaeological Methods and Practice (3 Credits)
A team-taught, interdisciplinary course discussing theories, methods, and ethical issues in the practice of archaeology.
Prerequisite: ANTH240, ARTH200, CLAS180, or CLAS190.
Cross-listed with: ANTH305, ARTH305, CLAS305.
Credit Only Granted for: ANTH305, ARTH305, CLAS305, or JWST319Y.

JWST324 Archaeology and the Quest for Ancient Israel (3 Credits)
The Hebrew Bible/Old Testament tells the story of "Biblical Israel" in ways that overlap with but are not identical to the evidence for "ancient Israel" provided by archaeological sources. Close attention to archaeology and inscriptional evidence allows for an understanding of biblical literature in light of its ancient Near Eastern context. Primary focus is on the Iron Age (ca. 1200-540 BCE), whose archaeology and inscriptions will be explored alongside biblical texts set during the this period but often written much later. Class discussion will address modern controversies regarding ancient Israel, including questions of origins (what does proto-Israelite mean?), problems of historiography (minimalist vs. maximalist), and archaeological dating (low chronology vs. high chronology).
Cross-listed with: HIST321.
Credit Only Granted for: HIST321 or JWST324.

JWST325 Jews and Judaism in Antiquity I: Sixth Century BCE through the First Century CE (3 Credits)
Political, social, and religious history of the Jews from the Persian period to the Judean revolt of 66-70 CE. Special attention to the rise of sectarian and revolutionary movements.
Cross-listed with: HIST370.
Credit Only Granted for: HIST370 or JWST325.

JWST326 Jews and Judaism in Antiquity II: First through Seventh Century (3 Credits)
Political, social, and religious history of the Jews from the destruction of the Jerusalem Temple in 70 CE to the Muslim conquests. Special attention to the political transformations in Judaism under late Roman Christianity, and the rise of the Rabbinic movement.
Recommended: HIST370.
Cross-listed with: HIST371.
Credit Only Granted for: HIST371 or JWST326.

JWST331 Early Christianity: Jesus to Constantine (3 Credits)
Social and religious history of early Christianity from its origin in the first century to the reign of Constantine.
Cross-listed with: HIST320.
Credit Only Granted for: HIST320 or JWST331.

JWST332 The Israeli Settler Movement: The Road to One State? (3 Credits)
Explores the Israeli settler movement over the last four decades, from its position on the fringes of Israeli society in the 1970s and 1980s to its rise to prominence in Israeli politics today. Topics will include the history of the Israeli settlement project in the West Bank, the emergence of Gush Emunim and its ideological foundations in Jewish messianism, its violent offshoots, and the influence of the settler movement on the Israeli political system. Study of these topics illuminates some of the most important driving forces of modern history such as nationalism, religious fundamentalism, colonialism and the ability of a determined minority to influence a country's policies.
Cross-listed with: HIST381, ISRL344.
Credit Only Granted for: HIST329G, HIST381, ISRL329G, ISRL344, JWST332 or JWST319N.
Formerly: JWST319N.

JWST333 Martyrs & Merchants, Lawyers & Mystics, Magicians & Messiahs: Jews Between Medieval and Modern Times (3 Credits)
In an era marked by traumatic expulsions, inquisitorial barbarism, and enforced ghettoization, Jews reinvented themselves. Through their international networks of trade, Jews learned how to negotiate with kings and to govern new, large urban communities in new lands. They took advantage of the printing press to reorganize their literary traditions of law, biblical studies and mysticism, and created new hierarchies of religious status. And they flocked to hear new kinds of enthusiast preachers, celebrating the man they saw as the messiah finally come. We will together explore the contradictory forces that ultimately gave birth to the modern Jew.
Recommended: HIST287 or JWST233; HIST 332; .
Cross-listed with: HIST373.
Credit Only Granted for: JWST333 or HIST373.

JWST334 Mizrahi Identity in Israel (3 Credits)
It is impossible to understand Israeli society today without examining the Mizrahi experience. Despite the common misconception that Israel is predominantly made up of Jews from European origin, the fact of the matter is that Jews of Mizrahi origin, whose parents and grandparents immigrated to Israel from the Middle East and North Africa, represent a major part of the Israeli population. Moreover, Ashkenazi-Mizrahi relations continue to be a major source of tension in Israeli politics, and issues of race continue to come up on social media and polarize the Israeli society. This course brings to light narratives of Mizrahi identity in Israel and explores the trajectory of the Mizrahi struggle for equality and against racism through its various milestones: the 1959 Wadi Salib Revolt, the Black Panthers Movement in the 1970s, the emergence of the Israeli Sephardi-Orthodox party Shas, and the new wave of Mizrahi activism in the 21st century.
Cross-listed with: ISRL330, HIST377.
Credit Only Granted for: JWST319D, JWST334, HIST377, HIST329Z, ISRL329M, or ISRL330.
Formerly: ISRL329M.

JWST341 American Jewish Literature (3 Credits)
An exploration of the role played by literature in the development of American Jewish ethnic identity. Primary materials include essays, poetry, plays, short stories, novels, films and music.Cross-listed with ENGL331.
Credit Only Granted for: ENGL331 or JWST341.

JWST344 Modern Jewish History II: World Jewry Since 1870 (3 Credits)
Social, political, economic, and cultural change in the Jewish world since 1870. Emphasis on emancipation, assimilation, and new forms of Jewish identity in Western and Eastern European Jewry from the 19th Century to the present.Cross-listed with HIST375.
Credit Only Granted for: HIST375 or JWST344.

JWST345 The Holocaust of European Jewry (3 Credits)
Roots of Nazi Jewish policy in the 1930's and during World War II: the process of destruction and the implementation of the "final solution of the Jewish problem" in Europe, and the responses made by the Jews to their concentration and annihilation.
Cross-listed with: HIST307.
Credit Only Granted for: HIST307 or JWST345.

JWST346 Representing the Holocaust (3 Credits)
Different perspectives on how the Holocaust should be represented. Examination of a wide range of texts including fiction, memoirs, critical essays, poems and films in different languages (in translation). Emphasis on the international and comparative nature of Holocaust literary studies and investigation into the propriety of literary representation of historical catastrophe. Consideration of our own role as readers serving as witnesses to an event that has marked itself indelibly in the aesthetic history of the twentieth century.
Credit Only Granted for: ENGL379J, JWST419I, ENGL332, or JWST346.
Formerly: ENGL379J and JWST419I.

JWST347 Tradition and Change: Jewish Religion in the Modern World (3 Credits)
An exploration of the history of the different modern Jewish religious movements that developed in Europe, starting with messianic movements and ending with Reform and Orthodoxy. Emphasis will be placed on the influence of the academic study of Judaism on the development of modern Jewish religious ideologies and practices.
Cross-listed with: HIST429X, RELS347.
Credit Only Granted for: RELS347, JWST347, HIST429X, or RELS419R.
Formerly: RELS419R.

JWST369 Special Topics in Study Abroad III (1-6 Credits)
Special topics course taken as part of an approved study abroad program.
Repeatable to: 15 credits if content differs.

JWST370 Before the Holocaust: The Golden Age of Eastern European Jewry (3 Credits)
An exploration of the history of the Jews of Eastern Europe from the period of the Polish Lithuanian Commonwealth until the Holocaust. Topics to be covered include religious, political, social, and cultural transformation of Jewish life in Eastern Europe in the context of the general political changes in the area.
Cross-listed with: HIST419Q.
Credit Only Granted for: JWST419E, JWST370, or HIST419Q.
Formerly: JWST419E.

JWST372 Jewry of Muscle: Zionism and Jewish Masculinity (3 Credits)
Part of the Zionist cultural project involved creating a new Jewish masculinity that would replace the diasporic "sissy Jew" with a strong, healthy new "Jewry of Muscle." Using literary and cinematic sources, we will analyze how these Zionist and Israeli cultural productions served to build (and sometimes undermine) this new model of Jewish masculinity.
Cross-listed with: ISRL372.
Credit Only Granted for: JWST319K, ISRL329K, JWST372 or ISRL372.
Formerly: JWST319K or ISRL329K.

JWST373 Sexuality in Jewish Literature and Culture (3 Credits)
Provides students with a unique exploration of texts and films created by various Jewish authors and filmmakers, and the way they dealt with questions of gender and sexuality. The texts and films touch on the central social, economic, and cultural issues of European, American, and Israeli Jewry during the middle ages, and up to the 19th, 20th and 21st centuries. It will explore how the categories of gender and sexuality changed and were represented in rich and contrasting ways according to the authors' social norms and ideological convictions. Focusing on sexuality and gender in Jewish culture can help us better understand Jewish social norms, creativity, and history, in particular modern Jewish literatures, visual medias, and the Jewish encounter with modernity as a whole. We will be reading prominent writers and filmmakers such as Sholem Aleichem, Philip Roth, S. Y., Jill Soloway, Abramovitsch, Todd Solondz, Celia Dropkin, I. B. Singer, Sholem Ash, Boaz Davidson, Judd Apatow, Tseruyah Shalev, and others. This is a discussion-based course; however, it also emphasizes developing the skills of analytical and abstract thinking and critical writing about texts and other cultural productions. This course does not require proficiency of any foreign language or any specific historical knowledge.
Credit Only Granted for: JWST319L or JWST373.
Formerly: JWST319L.

JWST374 Yiddish and the Supernatural: Demons, Golems, and Dybbuks (3 Credits)
Yiddish folklore is marked by a fascination with the mystical world and a rich tapestry of supernatural tales. Explore how Jewish communities have used storytelling to grapple with questions of faith, morality, identity, and the unknown, and how the golems, demons, and dybbuks of this tradition have been adapted in literary translations and cinematic adaptations. Through literary analysis, historical inquiry, and creative interpretation, this course examines the enduring power of these stories in Jewish culture and the broader traditions of magical realism and horror. All texts will be available in English translation.

JWST375 Jews and Representations of Race (3 Credits)
Attention to the evolution of Western concepts of "race" from late medieval to modern times requires addressing the meaning of the term "race." How did constructions of Jewish "racial" identities fit into this broader discussion? As Christian Europe's primary minority for centuries, "the Jews" provide evidence for constructions of race as a means of grouping populations culturally and materially. How did Jews interact with the racial discourse of diverse time periods, and how did they negotiate their political realities by both adopting and challenging aspects of the rhetoric of antisemitism as well as the rhetoric of "whiteness" versus "blackness"?
Cross-listed with: ISRL375.
Credit Only Granted for: ISRL375, JWST375, ISRL349Z, or JWST319M.
Formerly: ISRL349Z or JWST319M.

JWST386 Experiential Learning in Jewish Studies (3 Credits)
The Jewish Studies Program's internship program. Pre-professional experience in research, analysis, and writing related to Jewish Studies in a variety of work settings.
Prerequisite: Permission of ARHU-Meyerhoff Program & Center for Jewish Studies.
Restriction: Junior standing or higher.

JWST408 Honors Seminar in Jewish Studies (3 Credits)
An in-depth exploration of a theme in Jewish history, literature, culture or thought. Course subject and readings will vary from year to year, but will generally cut across periods, locations, or disciplines. Students are expected to engage the course material critically and to use the seminar as an opportunity to develop an independent research agenda.
Prerequisite: Permission of ARHU-Meyerhoff Program & Center for Jewish Studies.
Restriction: Junior standing or higher.

JWST409 Research Seminar in Jewish Studies (3-4 Credits)
A capstone course for Jewish Studies. Guides students through advanced source material and subject matter, research skills, and presentation techniques. A substantive paper based on independent research and analysis is one expected outcome.
Prerequisite: Must have completed two upper-level courses in an appropriate area of Jewish Studies; or permission of ARHU-Meyerhoff Program & Center for Jewish Studies.
Repeatable to: 9 credits if content differs.
Formerly: JWST309.

JWST418 Honors Thesis Research in Jewish Studies (3-6 Credits)
Guided research on a thesis under the supervision of the Jewish Studies faculty.
Repeatable to: 6 credits if content differs.

JWST419 Special Topics in Jewish Studies (3 Credits)
Repeatable to: 9 credits if content differs.

JWST427 The Epic of Gilgamesh (3 Credits)
One of the most famous tales from the ancient world, the Epic of Gilgamesh inspires readers with tales of friendship and loss, mortality, and the search for meaning. The story itself grew and changed over time and took on new meanings. Through study of the epic, its development over time, and the sources it drew from, this class will examine the meaning of the Gilgamesh epic and its impact on ancient Mesopotamian culture.
Prerequisite: JWST225, RELS225, HIST219I, or permission of the instructor.
Recommended: JWST262, ENGL262, or HEBR298B.
Cross-listed with: RELS427.
Credit Only Granted for: JWST419G, RELS419G, RELS427 or JWST427.
Formerly: JWST419G.

JWST429 Advanced Topics in Jewish Studies (3-4 Credits)
Special topics at an advanced level for Jewish Studies. Primarily intended for majors and graduate students.
Repeatable to: 12 credits if content differs.

JWST430 Dead Sea Scrolls (3 Credits)
A study of the Dead Sea Scrolls in their ancient and modern settings, and in terms of contemporary scholarly interpretations of their meaning. Interpretations of the historical significance of these documents, their connections to ancient Jewish sectarian movements, and their implications for our understanding of Judaism, Christianity, and the history of the Bible.
Prerequisite: Must have completed one JWST course or one RELS course; or permission of ARHU-Meyerhoff Program & Center for Jewish Studies. Cross-listed with RELS430.
Credit Only Granted for: JWST430 or RELS430.

JWST432 Jews in Medieval Times 1000-1450 (3 Credits)
Social and cultural life of Jewish communities spread throughout Islam and Christendom. Major topics include the Gaonate, kehila organizations, legal, rationalist, and mystical thought, and the context of rising animosity against Jews linked to the Crusades and changing Church doctrines.
Recommended: HIST282, HIST330, HIST331, or JWST234.
Cross-listed with: HIST476.
Credit Only Granted for: HIST476 or JWST432.

JWST452 The Golden Age of Jewish Philosophy (3 Credits)
Jewish philosophy from Maimonides in the 12th century to the expulsion of the Jews from Spain at the end of the 15th Century. Topics include the limitations of human knowledge, creation of the world, foreknowledge and free will, and the existence of God.
Prerequisite: 3 credits in PHIL courses; or permission of ARHU-Meyerhoff Program & Center for Jewish Studies; or permission of ARHU-Philosophy department.
Cross-listed with: PHIL417.
Credit Only Granted for: JWST452 or PHIL417.

JWST459 Readings in Medieval Hebrew (3-4 Credits)
Readings and analysis of Hebrew texts and literature from the Middle Ages. Language of instruction in English; all texts in Hebrew.
Repeatable to: 9 credits if content differs.
Credit Only Granted for: JWST459 or JWST466.
Formerly: JWST466.

JWST468 Readings in the Hebrew Bible (3-4 Credits)
Readings in the Hebrew text of the Bible. Emphasis in close reading, grammar analysis, and modern interpretations of the Bible. Language of instruction English; all texts in Hebrew.
Prerequisite: HEBR313; or permission of instructor.
Repeatable to: 9 credits if content differs.
Formerly: HEBR441 and HEBR442.

JWST469 Readings in Rabbinic Hebrew (3-4 Credits)
Readings in classical rabbinic texts and related corpora. Emphasis on grammar and reading skills as well as critical analysis of the material. Language of instruction: English; all texts in original language.
Prerequisite: HEBR313; or permission of instructor.
Repeatable to: 9 credits if content differs.

JWST471 Modern Hebrew Literature in Translation (3 Credits)
An exploration of modern Hebrew prose, poetry, and literary essays written from the 1880s through the present in Europe, Palestine, and Israel. An investigation of the challenges confronting authors such as Mendele Mokher Sforim, Avraham Mapu, Chaim Nahman Bialik, Dvorah Baron, S.Y. Agnon, and David Fogel as they tried to create a contemporary secular literature out of an ancient sacred language. All texts in English translation.

JWST478 Readings in Modern Hebrew (3 Credits)
Variable topics in Modern Hebrew Literature.
Prerequisite: HEBR313; or permission of instructor.
Restriction: Junior standing or higher.
Repeatable to: 12 credits if content differs.

JWST491 Judaism and the Construction of Gender (3 Credits)
The study of Jewish culture, religious practice, communal authority, and literature through the frame of such critical categories of analysis as gender, sexuality, masculinity, power, ethics, and the feminine.
Prerequisite: 1 course in JWST; or 1 course in LGBT; or 1 course in WMST or WGSS.
Cross-listed with: WGSS491.
Credit Only Granted for: JWST491, WMST491 or WGSS491.
Formerly: WMST491.

JWST492 Sex, Gender, and Jewish Identity (3 Credits)
An exploration of Jewish embodiment, including dynamics related to biological sex, culturally-framed gender, and sexuality. Topics of discussion may include transgender and intersex Jews, stereotypes and gender performance, modesty, genetics, and body alteration. Focus is on contemporary Jewish culture, framed within the larger historical and textual tradition.
Prerequisite: 1 course in WGSS; or 1 course in JWST; or 1 course in LGBT; or permission of instructor.
Cross-listed with: LGBT448W, WGSS492.
Credit Only Granted for: JWST492, JWST409G, LGBT448W, WMST498W or WGSS492.
Formerly: WMST498W and JWST409G.

JWST498 Advanced Language Module for Jewish Studies (1-3 Credits)
A supplementary language module for students enrolled in designated Jewish Studies classes. Language of instruction English, texts in original language.
Prerequisite: HEBR212 or JWST282; or permission of ARHU-Meyerhoff Program & Center for Jewish Studies.

JWST499 Independent Study in Jewish Studies (1-3 Credits)
Prerequisite: Permission of ARHU-Meyerhoff Program & Center for Jewish Studies.
Repeatable to: 6 credits if content differs.

KNES - Kinesiology

KNES112 Fitness Conditioning (1 Credit)
Students will learn a comprehensive overview of physical conditioning through a variety of training techniques (HIIT, resistance training, functional training, etc.) and the vast benefits of proper physical conditioning. This course will help students better understand the impact that aerobic, anaerobic, and resistance training have on the human body, including physical and mental health, preparation for sports, and general fitness at a beginning level.
Credit Only Granted for: KNES161N or KNES112.
Formerly: KNES161N.

KNES124 Group Cycling (1 Credit)
Students will learn the fundamentals of indoor cycling, muscles that are activated, training concepts and techniques, as well as the importance of flexibility and prevention of injuries. This course is designed to teach intermediate cycling and ensure safe cycling techniques during a cycling program.
Credit Only Granted for: KNES161C or KNES124.
Formerly: KNES161C.

KNES136 Beginning Golf (1 Credit)
Student will learn the game of golf through the development of new skills and improve on existing skills, while expanding knowledge about the game. This is a beginning golf class intended for those who have little or no previous playing experience.
Credit Only Granted for: KNES137N or KNES136.
Formerly: KNES137N.
Additional Information: This course meets at the University of Maryland Golf Course.

KNES151 Professional Lifeguard Training (1 Credit)
Lifeguarding will prepare students to respond to emergencies, promote safety in aquatic environments, and may even appeal to a future employer looking for a proven leader. Throughout the course, students will work towards American Red Cross certification requirements, including lifeguarding, CPR/AED, and First Aid. This class will also place an emphasis on professionalism, communication, teamwork, problem solving, and emergency response.
Recommended: Intermediate swimming skills, confidence in deep water.
Credit Only Granted for: KNES151 or KNES154W.
Formerly: KNES154W.
Additional Information: Students may obtain a lifeguard certificate/credential by passing a separate exam and skills test from the certifying organization. This is optional, and not required to earn course credit in the KNES151 course.

KNES153 Aquatic High Intensity Interval Training Fitness (1 Credit)
Aquatic HIIT Fitness is designed to lead students through a robust workout in a shallow water environment. Throughout the course, students will increase their level of fitness, build muscle and experience a different type of workout.
Recommended: Ability to perform high intensity exercises in an aquatic environment.
Additional Information: Students are not required to be strong swimmers to enroll in this course. All class activities will take place in shallow water (less than 5ft) or on the pool deck.

KNES156 Pickleball (1 Credit)
Provides students with a comprehensive overview of pickleball. This course will help students to better understand the basic skills and etiquette of pickleball, how to score and play in tournament situations, how to apply and articulate the basic rules of pickleball during singles and double play, and explain the health benefits of pickleball.
Restriction: Must be in a major within the Kinesiology department.

KNES164 Yoga for Strength (1 Credit)
A high-intensity yoga strength fitness experience, designed for students with minimal to some prior experience in physical yoga practice and fitness. Participants will engage in exercises that emphasize the benefits of light weights and high repetitions, aiming to enhance both strength and flexibility.
Restriction: Must be in the Kinesiology major (08351).

KNES173 Beginner BJJ & Martial Arts (2 Credits)
This is a coed physical activity course which introduces students to Brazilian Jiu-Jitsu through physically participating in fundamentals of the Art. Brazilian Jiu-Jitsu (BJJ) is a Brazilian martial art derived from the Japanese style, with a focus on grappling with particular emphasis on ground techniques. Students will learn basic escapes/submissions from ground positions. The student will learn and develop rudimentary skills necessary to progress in the above mentioned style. The course is taught at a beginner level and sparring (rolling) will not be permitted.

KNES180 Volleyball (1 Credit)
This course is intended for students with some volleyball experience. It will provide students with a comprehensive overview of the sport by integrating volleyball skills and tactics with a historical/sociocultural appreciation and value of the sport and its function or benefit in the greater sport world. Students will learn the rules and etiquette of volleyball, and implement their understandings in a series of skill & formation practices or tests, written assignment or exam, and tournament activities.
Restriction: Must be in a major within the SPHL-Kinesiology department.
Credit Only Granted for: KNES180 or KNES160N.
Formerly: KNES160N.

KNES182 Soccer (1 Credit)
Provides students with a comprehensive overview of the sport by integrating fundamental and beginning soccer skills with a historical appreciation for and current cultural importance of the sport. Students will learn the rules of soccer, basic soccer-specific training activities and use their understanding of rules and concepts in game related activities
Restriction: Must be in a major within the SPHL-Kinesiology department.
Credit Only Granted for: KNES182 or KNES152N.
Formerly: KNES152N.

KNES186 Basketball (1 Credit)
Basketball will provide students a comprehensive overview of the sport by integrating fundamental and advanced basketball skills with a historical appreciation for the sport and its function in the greater sporting world. Students will learn the rules of basketball, proper techniques and the basic principles of team offense and defense and implement their understanding of each in a series of informal and formal activities.
Restriction: Must be in a major within the SPHL-Kinesiology department.

KNES190 Flag Football (1 Credit)
Introduction to Flag Football will provide students with an overview of the game, terminology, rules, skills, and strategies. Students will develop and refine motor skills and movement patterns as they relate to flag football, as well as apply flag football concepts and strategies while focusing on team communication. Students will recognize and discuss the value of physical activity for health, enjoyment, challenge, inclusivity, confidence, fitness, and social interaction, specifically as it relates to flag football and NFL FLAG.
Restriction: Must be in a major within the SPHL-Kinesiology department.

KNES192 Ultimate Frisbee (1 Credit)
This class will range from beginner techniques on throws and ultimate terminology and rules through a more complete understanding of the game and strategy which goes along with playing it. After the course, the goal is for students to be able to play in a pick up game, recreational league, or potential higher level of competition if desired.
Restriction: Must be in a major within the SPHL-Kinesiology department.
Additional Information: After the first day class will meet outdoors as much as weather permits.

KNES200 Introduction to Kinesiology (3 Credits)
Kinesiology is the interdisciplinary study of physical activity that includes seven sub-disciplines: 1) exercise physiology; 2) biomechanics; 3) sport psychology; 4) motor development; 5) motor control; 6) sport history; and 7) sport sociology. This course will examine these areas of study within Kinesiology from scientific and applied perspectives.
Restriction: Must be in a major within the SPHL-Kinesiology department.
Credit Only Granted for: KNES200 or KNES201.

KNES201 Kinesiological Principles of Physical Activity (1 Credit)
An introduction to Kinesiology, the study of human movement, through the experience of learning a specific motor skill or being engaged in physical activity. Emphasis on the theories and knowledge underlying the learning and performance of all motor and sport skills.
Corequisite: Any physical activity course, e.g., KNES 100-190; or permission of SPHL-Kinesiology department.
Restriction: Must be in a major in SPHL-School of Public Health.
Credit Only Granted for: KNES200 or KNES201.

KNES214 Science and Methods of Personal Fitness Instruction (3 Credits)
Basic concepts of human anatomy, exercise physiology, applied kinesiology, nutrition and the physiology of exercise training. Includes the CORE knowledge required for the American Council on Exercise (ACE) Personal Trainer certification.
Credit Only Granted for: KNES214 or KNES210 and KNES211, or KNES210 and KNES212, or KNES289N.
Formerly: KNES210/KNES211, KNES210/KNES212, and KNES289N.

KNES222 Gambling in the New Millennium: Poker, The Preakness, Point-spreads, Powerball and Public Policy (3 Credits)
Is gambling in the public interest? Students will critically examine the various implications of "what it means to gamble" through investigations of various gambling forms, different sectors of the gambling industry and the related economics, along with consumer behavior, sport, public policy and public health in this context.
Recommended: ENGL101 and COMM107.

KNES225 Hoop Dreams: Black Masculinity and Sport (3 Credits)
Has sport disadvantaged African American males? This course critically examines sport as a site where notions of black masculinity are publicly debated, critiqued, challenged, celebrated, and also transformed. Utilizing an interdisciplinary approach, this course explores how sport has been invoked across the political and ideological spectrum to interrogate a number of issues impacting the life chances of young, African Americans males including educational attainment, poverty, social mobility, racism, cultural production, and notions of masculinity.

KNES226 The Cybernetic Human (3 Credits)
Can the profound and rapid technological advances experienced in the 21st century change what it means to be human or the nature of humanity? Emergent technologies, new materials, increased computer power, engineering innovations, and groundbreaking work in the sciences of cognition and action provide myriad opportunities for repairing and enhancing the human body and brain. Examines the ethical, social, and technological implications of an increasing synergism of technology and the body in sports and the arts, at work or home, rehabilitating the body and the brain, and society at large.

KNES243 Sports Finance & Business Intelligence (3 Credits)
As society has evolved with advances in technology, so have the financial and analytical fundamentals of spectator sports leagues. In this course, students will examine modern business principles in for-profit sports leagues, understand current practices for successful operation and revenue generation, and explore how analytics and emerging categories play a crucial role in an organization's growth and competitiveness in their respective markets.

KNES246 Transformational Leader in Sport: The Art and Science of Coaching (3 Credits)
Highlights the expectations and ethical problems facing developmental sport programs and youth athletic coaches today. Explores the continuum of coaching from Buttermaker (Bad News Bears) to Belichick (New England Patriots). We first examine the issues of sports, physical inactivity and obesity from a physiological, psychological, social, political, and economic perspective. Next, we will focus on how transformational leadership behaviors, knowledge, and communication influence changes in intrapersonal, interpersonal, and environmental aspects. Finally, we will employ a practical, manageable method for coaches to develop their athletes and programs.

KNES260 Science of Physical Activity and Cardiovascular Health (3 Credits)
Course details (1) the public health importance of and the processes underlying cardiovascular disease, (2) the risk factors for cardiovascular disease and the methods whereby they were identified, and (3) the principles of the scientific evidence supporting the use of physical activity to prevent cardiovascular disease.

KNES264 Foundations of Food, Physical Activity, and Health (3 Credits)
Designed for both kinesiology majors and non-majors to explore the basics of nutrition, activity & exercise, and human health. What is a calorie? What is metabolic rate? How do our daily activities alter our metabolism? What are the short- and long-term benefits of exercise? How do equity and access to food and physical activity affect health? Is sedentary behavior a greater health risk than being overweight? This blended course allows students to investigate nutrition and physical activity they encounter in their everyday life, as well as examine how differences in equity and access can affect health.
Credit Only Granted for: KNES264, KNES289F or NFSC100.
Formerly: KNES289F.

KNES265 Mathematical, Physical, & Statistical Basis of Kinesiology (3 Credits)
Mathematical, physical, and statistical foundations for human movement quantification, analysis, and evaluation. Upon successful completion, this course is expected to better prepare students for the science Core courses, such as biomechanics, exercise physiology, and motor control, that are required for Kinesiology majors.
Credit Only Granted for: KNES265 or KNES289P.
Formerly: KNES289P.

KNES282 Basic Care and Prevention of Athletic Injuries (3 Credits)
Theoretical and practical foundations of the prevention, recognition, and basic rehabilitation of athletically related injuries and common sport conditions.
Restriction: Must be in a major within the SPHL-Kinesiology department.

KNES285 History of Physical Culture, Sport, & Science in America (3 Credits)
Examines the history of physical culture in America, focusing on the period from the end of the Civil War to the Cold War. Physical culture refers to a broad range of movement practices including sport, play, rehabilitative exercise, health and fitness training, and recreation and leisure. More specifically, we challenge the idea that historical physical culture practices--and the scientific processes from which they were derived--were 'neutral' or 'objective'; rather, we explore the cultural, social, political, and economic contexts shaping physical culture knowledge, study, structures, and policies across American history. The goal is for you to learn and apply techniques of historical analysis to develop a critical understanding of how knowledge about, and practices of, physical culture supported a particular social order via the construction of difference, norms, and/or hierarchies, and ultimately contributed to some of the inequalities that endure today.
Restriction: Restricted to majors or non-majors with less than or equal to 60 credits.
Credit Only Granted for: KNES285 or KNES293.

KNES286 Empowering Healthy Physical Activity (3 Credits)
Learn evidence-based techniques that health professionals use to promote physical activity programs that meet the needs of diverse populations. Develop and implement an intervention plan targeting a specific population.

KNES287 Sport and American Society (3 Credits)
Sport will be related to such social problems as delinquency, segregation, collective behavior, and leisure; to social processes such as socialization, stratification, mobility, and social control; and to those familiar social institutions the family, the school, the church, the military, the economy, the polity, and the mass media.
Recommended: Minimum grade of C- in KNES285.

KNES289 Topical Investigations (1-6 Credits)
Independent study by an individual student or a group of students in special areas of knowledge not covered by regularly scheduled courses.
Repeatable to: 6 credits.

KNES293 History of Sport in America (3 Credits)
The growth and development of sport in America. The transformation of sport within the perspective of American history, including class sport, professionalization, amateurism, and international involvement.

KNES300 Biomechanics of Human Motion (4 Credits)
The study of human movement and the physical and physiological principles upon which it depends. Body mechanics, posture, motor efficiency, sports, the performance of a typical individual and the influence of growth and development upon motor performance.
Prerequisite: Minimum grade of C- in BSCI201; and minimum grade of C- in MATH113 or higher.
Recommended: KNES265 or PHYS121.
Restriction: Must be in a major within SPHL-Kinesiology department.

KNES305 Principles & Application of Exercise Rehabilitation (3 Credits)
In-depth analysis of the basic principles of rehabilitation and exercise programming for common injuries encountered in a clinical setting. Basic assessment techniques, ranges of motion, muscular anatomy, rehabilitative protocols, and exercise modalities are a major focus.
Prerequisite: Minimum grade of C- in BSCI201 and BSCI202; and 1 course with a minimum grade of C- from (KNES300, KNES350, KNES360, KNES370, KNES385).
Restriction: Must be in a major within the SPHL-Kinesiology department; and must have earned a minimum of 75 credits.

KNES306 Prosthetics for Limb Amputations (3 Credits)
Introduction to the science of prosthetics and the artificial devices that are designed, developed and fit to replace the missing body part or parts lost through trauma, disease or congenital conditions.
Prerequisite: Minimum grade of C- in BSCI201, BSCI202, and KNES300.
Restriction: Must be in a major within the SPHL-Kinesiology department; and must have earned a minimum of 75 credits.

KNES320 Physiological Basis of Physical Activity and Human Health (4 Credits)
A study of the responses and chronic adaptations to physical activity and exercise, with particular emphasis on the interaction between human health and physical activity. The laboratory component of course will focus on the assessment of physical activity and measurement of physiological adaptations to exercise. Students are expected to gain an understanding and appreciation for the benefits of physical activity and exercise in the context of public health.
Prerequisite: Minimum grade of C- in BSCI201 and BSCI202.
Restriction: Must be in Public Health Science program.
Credit Only Granted for: KNES360 or KNES320.

KNES332 Exercise Testing & Prescription for Fitness Professionals (3 Credits)
Practical applications of exercise physiology and psychology to target fitness instruction for the general adult population Includes discussion of certification standards and professional development as well as evaluation of program safety and current trends.
Prerequisite: Minimum grade of C- in KNES360.
Restriction: Must be in a major within the SPHL-Kinesiology department; and must have earned a minimum of 75 credits.

KNES333 Motor Development and Fitness for Individuals with Disabilities (3 Credits)
Implications of Federal and State regulations for planning and implementing motor development and physical fitness programs for individuals with disabilities. Evaluation strategies for assessing motor performance and fitness levels in educational programs for these individuals.
Prerequisite: Minimum grade of C- in KNES370.
Restriction: Must be in a major within the SPHL-Kinesiology department; and must have earned a minimum of 60 credits.

KNES334 Adapted Physical Activity: Empowering People with Disabilities to Lead a Healthy and Active Lifestyle (3 Credits)
Study of the field of adapted physical activity and its impact on the health and wellness of individuals with disabilities. Students will design an adapted physical activity program proposal and develop the skills needed to empower people with disabilities to participate in physical activity and sports programs. Students will explore their own perceptions towards disability and how people with disabilities are portrayed in our society. They will study the etiology of disabling conditions and the implications for participating in physical activity.
Prerequisite: Minimum grade of C- in KNES370 .
Restriction: Must have earned a minimum of 90 credits.

KNES340 The Foundations of Public Health in Kinesiology (3 Credits)
An investigation of the role of physical activity and inactivity in relation to health and well-being through a public health perspective. Past and current perspectives on health promotion, health education, and social policies and approaches will be examined for various populations.
Prerequisite: Minimum grade of C- in KNES287; and minimum grade of C- in SPHL100.
Restriction: Must be in a major within the SPHL-Kinesiology department; and must have earned a minimum of 75 credits.
Credit Only Granted for: KNES340 or KNES400.
Formerly: KNES400.

KNES342 Sport, Commerce, and Culture in the Global Marketplace (3 Credits)
The Sport, Commerce, and Culture in the Global Marketplace study abroad program is designed for students who are interested in the relationship between sport, culture, and the contemporary global economy.
Recommended: KNES287.
Credit Only Granted for: KNES389A or KNES342.
Formerly: KNES389A.

KNES346 Sport for Development (3 Credits)
Examines how sport-based programs and organizations are used by governments, multinational corporations, and non-government organizations (NGO's) to reach personal, community, national and international development objectives; focuses on theorizing the histories of international development and contemporary global issues; contextualizes the interrelationship of theory, institutions, and practices of domestic and international sport for development and peace programing.
Prerequisite: Must have earned a minimum grade of C- in KNES287.
Recommended: KNES485.
Restriction: Must be a major within the SPHL-Kinesiology department and must have earned a minimum of 75 credits.

KNES347 Sport Economics (3 Credits)
Through combining fantasy football with a sports business simulation, students will develop a better understanding of the sports industry through the application of economic concepts. Topics include: sports teams and leagues, public finance of stadiums and sports events, and labor issues in sports.
Prerequisite: Minimum grade of C- in KNES287.
Recommended: KNES355, ECON111, and ECON200.
Restriction: Must have earned a minimum of 75 credits.
Credit Only Granted for: KNES347 or KNES389I.
Formerly: KNES389I.

KNES350 The Psychology of Sports & Exercise (3 Credits)
An exploration of personality factors, including but not limited to motivation, aggression and emotion, as they affect sports participation and motor skill performance.
Restriction: Must have earned a minimum of 45 credits.

KNES352 Global Perspectives of Physical Activity (3 Credits)
Introduces global perspectives of physical activity to students within the School of Public Health who are studying abroad. Students will be able to creatively explore the physical activity culture in their host city by engaging in a variety of assignments, including a group podcast and data uploads. Additionally, students will demonstrate overall knowledge gained from the course by writing a case study report that focuses on how they are physically active abroad versus at home, tying in key concepts of public and global health.
Prerequisite: Minimum grade of C- in SPHL100 and any KNES Core course.
Restriction: Must be in a major in SPHL-School of Public Health.

KNES354 Sports Finance & Business Intelligence (3 Credits)
As society has evolved with advances in technology, so have the financial and analytical fundamentals of spectator sports leagues. In this course, students will examine modern business principles in for-profit sports leagues, understand current practices for successful operation and revenue generation, and explore how analytics and emerging categories play a crucial role in an organization's growth and competitiveness in their respective markets. Through their foundational understanding and data analysis, students gain competency in identifying threats to revenue growth and explore emerging categories to offset those threats and further diversify the product offerings to enhance the viability of sports organizations.
Prerequisite: At least 1 course from the Kinesiology core courses at the 300-level or higher completed with a minimum grade of C-.
Restriction: Must have earned a minimum of 75 credits.
Credit Only Granted for: KNES243 or KNES354.
Formerly: KNES243.

KNES355 Sport Management (3 Credits)
Application of concepts and issues related to management principles and business concerns across various sections of the sport industry. Principles pertaining to the management of sport organizations.
Prerequisite: Minimum grade of C- in KNES287.
Restriction: Must be in a major within the SPHL-Kinesiology department; and must have earned a minimum of 75 credits.

KNES360 Physiology of Exercise (4 Credits)
A study of the physiology of exercise, including concepts of work, muscular contraction, energy transformation, metabolism, oxygen debt, and nutrition and athletic performance. Emphasis on cardiovascular and respiratory function in relation to physical activity and training.
Prerequisite: Minimum grade of C- in BSCI201 and BSCI202; or permission of SPHL-Kinesiology department.
Restriction: Must be in one of the following programs (Kinesiology; Public Health Science).

KNES370 Motor Development (3 Credits)
Motor development across the life span. The developmental sequences of motor skills from birth to old age; neuromaturation of neuromuscular system; analysis of the underlying mechanisms of motor skill development; and correlates of motor development.
Restriction: Must be in a major within SPHL-Kinesiology department.

KNES385 Motor Control and Learning (4 Credits)
This introductory course investigates how humans control and adapt their movements to perform and learn a variety of motor skills, ranging from activities of daily living to elite athlete performance. This course examines the underlying cognitive, sensory and motor processes of control and adaptation of human movements both at the behavioral and neurophysiological levels. Relevant applications to movement rehabilitation as well as performance optimization are employed to illustrate the concepts discussed in class. The cognitive, sensory and motor mechanisms underlying motor control are explored first and then in a motor learning context.
Prerequisite: Minimum grade of C- in BSCI201, and a minimum grade of C- in MATH113 or higher.
Recommended: KNES265 or PHYS121.
Restriction: Must be in a major within SPHL-Kinesiology department.

KNES386 Service Learning in Kinesiology (3 Credits)
Provides students practical experiences by applying classroom concepts and skills to real-world situations in the local community. Students will serve as volunteer coaches and mentors with a community organization focused on promoting physical activity and social-emotional learning/ well being.
Prerequisite: Must have completed three KNES core classes.
Restriction: Must be in a major within the SPHL-Kinesiology department; and must have earned a minimum of 75 credits; and must have permission from the Kinesiology department.
Additional Information: Coaching days and times will vary by the community organization, and some locations may be off-campus.

KNES389 Topical Investigations (1-3 Credits)
Independent study by an individual student or a group of students in special areas of knowledge not covered by regularly scheduled courses.
Repeatable to: 6 credits.

KNES401 Zip Code: Prediction of Physical Activity & Health (3 Credits)
An exploration of the relationship and impacts of built and other social environments on health, including physical activity, social equity, gentrification, and many others.
Prerequisite: Minimum grade of C- in SPHL100.
Restriction: Must have earned a minimum of 75 credits; and must be in a major within, SPHL-Kinesiology department.

KNES402 Biomechanics of Sport (3 Credits)
Mechanical determinants influencing sport techniques. A quantitative, scientific basis for sport analysis with emphasis on the application to numerous sport activities. Evaluation and quantification of the filmed performance of athletes.
Prerequisite: Minimum grade of C- in KNES300.
Restriction: Must be in a major within the SPHL-Kinesiology department; and must have earned a minimum of 75 credits.

KNES405 Principles & Techniques of Manual Muscle Testing (3 Credits)
It is critical for sports medicine and sport performance specialists to understand the location and inter-relationships of the structures of the body that impact human movement. Thus, the primary purpose of this course is to facilitate an in-depth, understanding of the muscles of the body. Specifically, students will learn the origins, insertions, primary and secondary functions, as well as nervous innervations of the major muscle groups of the body. In addition, students will develop palpation skills and learn to grade the function of each muscle through manual muscle testing techniques. These skills form the foundation for assessing functional movement as well as performing safe and effective manual therapy techniques. Thus, while the focus of the class will be to develop sound, introductory palpation and manual muscle testing skills, basic principles of functional movement and manual therapy will also be addressed through hands-on application as well as case study.
Prerequisite: Minimum grade of C- in BSCI201 and BSCI202; and 1 course with a minimum grade of C- from Kinesiology core courses at the 300-level or higher.
Restriction: Must be in a major within the SPHL-Kinesiology department; and must have earned a minimum of 90 credits.

KNES406 Clinical Biomechanics: Musculoskeletal Injury (3 Credits)
An in-depth analysis of the biomechanical foundations underlying musculoskeletal injury. Emphasis is placed on the biomechanical mechanisms responsible for injury causation, the resultant effects on musculoskeletal tissues, and the current scientific understanding of strategies for injury prevention.
Prerequisite: Minimum grade of C- in KNES300.
Restriction: Must be in a major within the SPHL-Kinesiology department; and must have earned a minimum of 75 credits.
Credit Only Granted for: KNES406 or KNES498V.
Formerly: KNES498V.

KNES411 Black Bodies & Green Space: From 1619 to Today (3 Credits)
Nature-based physical activity, also known as green exercise, involves engaging in physical activity within natural environments like parks, forests, or other green spaces. But, access or a sense of belonging to these spaces has not and still is not equitable. This experiential course will take a historical look as to why that has been the case...From the enslaved African on antebellum plantations, who used the surrounding uncultivated land as a place of deliverance, healing and route to freedom, to the Central Park bird watcher, whose green space presence was perceived as a threat to White physical safety, we will critically examine how systemic racism shaped the experience, connection, and relationship to nature among Black Americans.
Prerequisite: Minimum grade of C- in KNES285.
Restriction: Must have earned a minimum of 75 credits.
Credit Only Granted for: HNUH218Y or KNES411.
Formerly: HNUH218Y.

KNES440 Psychology of Athletic Performance (3 Credits)
Examines the psychological factors, mechanisms, and processes in athletic performance. Utilizes a social psychological approach to focus on the study and review of individual performance in both the interpersonal and social context.
Prerequisite: Minimum grade of C- in KNES350.
Restriction: Must have earned a minimum of 75 credits.

KNES442 Psychology of Exercise and Health (3 Credits)
Examines the antecedents and consequences of exerciese behavior. Explores motivation, attitude, control, socialization. Proposes intervention strategies at the individual, organizational and societal levels.
Prerequisite: Minimum grade of C- in KNES350.
Restriction: Must be in a major within the SPHL-Kinesiology department; and must have earned a minimum of 75 credits.

KNES445 Exercise and Brain Health (3 Credits)
Examines the evidence for exercise to affect brain function and brain health in children, in adults, and in old age. Covers the adaptations to acute and chronic exercise within brain networks related to emotion, stress reactivity, memory, and executive function, and the effectiveness of physical activity and exercise as treatments for depression, anxiety disorders, and cognitive impairment.
Prerequisite: Minimum grade of C- in KNES350.
Restriction: Must be in a major within the SPHL-Kinesiology department; and must have earned a minimum of 75 credits.

KNES450 From the Olympics to the Rehabilitation Clinic: Mental Skills Training Applications (3 Credits)
The examination and application of the major concepts of human performance psychology in, and beyond, the professional, collegiate, amateur and youth sport athletic spaces to allied health practitioner (PT, OT, OR, PA, RN), athletic and personal training, and tactical athlete (i.e., military, law enforcement, and firefighting) environments. An essential component of the class will be the reliance on reading and reviewing both classic articles and the recent evidence-based research in which applied strategies and techniques are based. Students will be taught to critically analyze the research by 1) understanding the purpose of the research, 2) identifying the experimental design and how it contrasts the difference between experimental and control conditions, 3) understanding the outcome of the research, and 4) understanding how the outcome of the research may be applicable to the human performance and allied health environments.
Prerequisite: Minimum grade of C- in KNES350.
Restriction: Must be in a major within the SPHL-Kinesiology department; and must have earned a minimum of 75 credits.
Credit Only Granted for: KNES498G or KNES450.
Formerly: KNES498G.

KNES451 Children and Sport: A Psychosocial Perspective (3 Credits)
Examination of youth sports from a psychosocial perspective, including the impact of highly structured sports on young athletes and the complex social network of coaches, parents and peers.
Prerequisite: Minimum grade of C- in KNES350.
Restriction: Must be in a major within the SPHL-Kinesiology department; and must have earned a minimum of 90 credits.

KNES457 Managing Youth Programs: Educational, Fitness and Sport (3 Credits)
An examination of the basic functions involved in managing physical education, fitness, and youth sports programs. Focus on leadership skills, organizational management, and techniques for applying learned skills in a variety of organizational settings that serve the nation's youth.
Prerequisite: Minimum grade of C- in KNES350 and KNES370.
Restriction: Must be in a major within the SPHL-Kinesiology department; and must have earned a minimum of 75 credits.

KNES460 Physiology of Aging and the Impact of Physical Activity (3 Credits)
Biology of the aging process in healthy individuals and those with chronic disease, the effects of acute exercise and exercise training on the physiological decline that occurs in humans, and the role that regular physical activity plays on enhancing the quality of life and activities of daily living in individuals.
Prerequisite: 1 course with a minimum grade of C- from (KNES320, KNES360).
Restriction: Must be in one of the following programs (Kinesiology; Public Health Science); and must have earned a minimum of 75 credits.

KNES462 Neural Basis of Human Movement (3 Credits)
An introduction to the neural substrates which underlie postural and volitional movement. Neuroanatomical and neurophysiological basis of motor functioning; past and present conceptualizations of motor control and coordination; movement disorders; and maturation of the neuromuscular system. Students with career goals in allied health or medical fields will benefit from this overview of both the peripheral and the central nervous system, with a special focus on the control of motor behavior. Topics covered will range from neural signaling to sensory processing, to central control of movement, and to relevant 'higher' cognitive processes pertaining to movement execution and recovery.
Prerequisite: Minimum grade of C- in BSCI201, BSCI202, and KNES385; or permission of SPHL-Kinesiology department.
Restriction: Must have earned a minimum of 75 credits.

KNES463 Type 2 Diabetes and Physical Activity Seminar (3 Credits)
Students will examine and critically analyze the current research literature relevant to the diagnosis, prevalence, and impact of the current diabetes epidemic in the US. Students will also study the current state of knowledge relative to the use of physical activity to prevent and treat diabetes. This seminar format class is heavily based on student presentations, student participation, and student writing assignments.
Prerequisite: Minimum grade of C- in KNES360.
Restriction: Must be in the Kinesiology major; and must have earned at least 75 credits.
Credit Only Granted for: KNES498D or KNES463.
Formerly: KNES498D.

KNES464 Exercise Metabolism: Role in Health and Disease (3 Credits)
Examines the role of metabolism in kinesiology, especially as it relates to physical inactivity, health and disease. Includes bioenergetics, substrate utilization, cell signaling, and metabolic gene expression and their impact on chronic health conditions or disease.
Prerequisite: Minimum grade of C- in KNES360.
Restriction: Must have earned a minimum of 75 credits.

KNES465 Physical Activity and Disease Prevention and Treatment (3 Credits)
Critically examines the scientific evidence that supports the use of physical activity to prevent and treat age-related diseases, including cardiovascular disease, diabetes, abnormal lipoprotein-lipid levels, hypertension, obesity, osteoporosis and cancer.
Prerequisite: 1 course with a minimum grade of C- from (KNES320, KNES360).
Restriction: Must have earned a minimum of 75 credits.

KNES466 Graded Exercise Testing (3 Credits)
Functional and diagnostic examination of the cardiovascular responses to graded exercise testing. Emphasis on electrophysiology, mechanisms of arrhythmias, normal electrical activation of the heart, axis termination and the normal 12-lead electrocardiogram.
Prerequisite: Minimum grade of C- in KNES360.
Restriction: Must be in a major within the SPHL-Kinesiology department; and must have earned a minimum of 75 credits.

KNES467 Physical Activity & the Treatment & Prevention of Obesity (3 Credits)
Students will examine and critically analyze the current research literature relevant to the diagnosis, prevalence, and impact of the current obesity epidemic in the US. Students will also study the current state of knowledge relative to the use of physical activity to prevent and treat obesity. This seminar format class is heavily based on student presentations, student participation, and student writing assignments. The course is primarily based on presentations by the instructor and the students followed by in depth discussions of the implications of the data.
Prerequisite: Minimum grade of C- in KNES360.
Restriction: Must have earned a minimum of 75 credits.
Credit Only Granted for: KNES467 or KNES498O .
Formerly: KNES498O.

KNES471 Assistive Technologies for Restoration of Human Motor Functions (3 Credits)
Presents the main assistive technologies and their applications for rehabilitation of individuals whose daily motor activities such as mobility and object manipulations are difficult or impossible. Students will learn how rehabilitative technologies work and understand their effectiveness to restore human movements. Students will learn how performance is evaluated in individuals operating rehabilitative technologies. This course will allow students to better understand assistive technology and their utilization for individuals with motor disabilities at work, at home and in the community. This course is particularly relevant for students who wish to pursue a career in rehabilitation and allied health.
Prerequisite: Minimum grade of C- in BSCI201, BSCI202, and KNES385; and a minimum grade of C- in MATH113 or higher.
Recommended: KNES265 or PHYS121. Basic knowledge of MS Excel or Matlab.
Restriction: Must have earned a minimum of 75 credits and must be in a major within SPHL-Kinesiology department.

KNES474 Quantitative Methods in Cognitive Motor Behavior - MATLAB (3 Credits)
Includes basic computer programming, algorithm, and quantitative techniques for time-series data with an emphasis on, but not limited to, human movement. These topics will be taught using MATLAB, a programming language and environment for numerical computation, data analysis, and visualization.
Prerequisite: MATH115 or equivalent; or permission of Kinesiology department.
Recommended: MATH240.
Restriction: Must have earned a minimum of 75 credits.

KNES476 Honors Thesis Proposal (3 Credits)
Development of honors thesis proposal based on preliminary research and literature review. Presentation of formal proposal to the thesis committee and fellow honors students.
Corequisite: KNES478.
Restriction: Must be a KNES Honors student; and senior standing.

KNES477 Honors Thesis (3 Credits)
Advisement will be on the individual basis. Thesis must be defended in the honors seminar.
Prerequisite: KNES476.
Corequisite: KNES478.
Restriction: Must be a KNES Honors student; and senior standing.

KNES478 Honors Seminar (1-3 Credits)
Guided discussion of research topics of current interest.
Restriction: Must be a KNES Honors student; and junior standing or higher.
Repeatable to: 4 credits if content differs.

KNES482 Socio-behavioral Aspects of Human Movement (3 Credits)
Derivation, formulation, and application of research in the socio-behavioral aspects of human movement.
Prerequisite: KNES293, KNES350, and KNES287.

KNES483 Sport Marketing and Media (3 Credits)
Industry practices in sport marketing and media. Marketing strategies and consumer behavior in different sport contexts. Critical examination of selected social and economic issues related to the buying and selling of sport.
Prerequisite: Minimum grade of C- in KNES287.
Recommended: KNES355.
Restriction: Must be in a major within the SPHL-Kinesiology department; and must have earned a minimum of 75 credits.

KNES484 Sporting Hollywood (3 Credits)
Popular representations of sport within the film media related to wider social discourses on bodies and the politics of various categories of subjectivity (gender, sex, race, class and nationality).
Prerequisite: Minimum grade of C- in KNES285 and KNES287.
Restriction: Must be in a major within the SPHL-Kinesiology department; and must have earned a minimum of 75 credits.

KNES485 Sport and Globalization (3 Credits)
Examination of sport culture from a global perspective; focuses on theorizing the similarities and differences between various national sporting cultures.
Prerequisite: Minimum grade of C- in KNES287.
Restriction: Must be in a major within the SPHL-Kinesiology department; and must have earned a minimum of 75 credits.

KNES487 Women, Sports and Culture (3 Credits)
A study of the historical barriers to women's participation in physical activity, efforts to dismantle those barriers, and the differentiation that exists in women's sport and physical culture today. Exploration of the historical and contemporary factors involving female athletes in U.S. culture.
Prerequisite: Minimum grade of C- in KNES287.
Restriction: Must be in a major within the SPHL-Kinesiology department; and must have earned a minimum of 75 credits.

KNES497 Kinesiology Senior Seminar (3 Credits)
Discussions of contemporary issues vital to the discipline, critiques of research in the student's area/areas of special interest, completion of a major project where the student will be asked to demonstrate the ability to carry out investigative processes in problem solving and critical writing under faculty direction.
Prerequisite: A professional writing course with a minimum grade of C-; and must have completed 6 KNES core courses and 2 KNES option courses, all with a C- or higher; and must have completed STAT100 with a C- or better.
Restriction: Senior standing or higher; and must be in Kinesiology program; and permission of department.

KNES498 Special Topics in Kinesiology (3 Credits)
Topics of special interest in areas not covered by regularly scheduled courses.
Prerequisite: Permission of SPHL-Kinesiology department.
Repeatable to: 99 credits if content differs.

KORA - Korean

KORA101 Elementary Korean I (3 Credits)
Introduction to the Korean language. Primary emphasis on oral skills, but Hangul, the Korean alphabet, will also be introduced.
Prerequisite: Must have appropriate World Language Placement (WLP) score; and permission of ARHU-School of Languages, Literatures, and Cultures department.

KORA102 Elementary Korean II (3 Credits)
Continued training in elementary spoken and written Korean.
Prerequisite: KORA101; or must have appropriate World Language Placement (WLP) score.
Restriction: Must be a non-Heritage student; and permission of instructor required for new students.

KORA103 Intensive Elementary Korean I (6 Credits)
Intensive introduction to the Korean language at the elementary level through a highly interactive approach, including oral, reading, and writing skills (Hangeul alphabet). Substantial cultural component familiarizes students with various aspects of Korean culture. Designed for students with no formal education in the Korean language. Taught in Korean.
Prerequisite: Must have appropriate World Language Placement (WLP) score.
Restriction: Must not be a native/fluent speaker of Korean; and must be in the Summer Language Institute; and must have permission of the School of Languages, Literatures, and Cultures.
Credit Only Granted for: KORA101 or KORA103.
Additional Information: Native/fluent speakers of Korean or students who have previously attended school in Korea should take the WLP and see the Korean Program Advisor to identify the correct Korean course for which to register.

KORA104 Intensive Elementary Korean II (6 Credits)
Continuation of KORA103 or KORA101. Intensive training in elementary level Korean including formal and informal speech styles through a highly interactive approach. Continues to build and enhance accuracy in basic literacy skills, vocabulary, and grammar, as well as situational appropriateness. Substantial cultural component familiarizes students with various aspects of Korean culture. Taught in Korean.
Prerequisite: KORA101 or KORA103; or equivalent, as determined by the World Language Placement (WLP).
Restriction: Must not be a native/fluent speaker of Korean; and must be in the Summer Language Institute; and must have permission of the School of Languages, Literatures, and Cultures.
Credit Only Granted for: KORA102 or KORA104.
Additional Information: Native/fluent speakers of Korean or students who have previously attended school in Korea should take the WLP and see the Korean Program Advisor to identify the correct Korean course for which to register.

KORA201 Intermediate Korean I (3 Credits)
An intermediate-level course designed for non-Heritage students. It begins the second year of instruction in the University's two-track Korean Program.
Prerequisite: KORA102; or permission of instructor.

KORA202 Intermediate Korean II (3 Credits)
The second stage of an intermediate-level course designed for non-Heritage students. It continues the second year of instruction in the University's two track Korean Program.
Prerequisite: KORA201; or permission of instructor.

KORA203 Intensive Intermediate Korean I (6 Credits)
Builds upon the foundation established in KORA104 or KORA102, further developing students' communicative competence in Korean. This course expands vocabulary and grammatical structures to enable more complex communication. Students will also continue to develop their reading and writing skills, expanding vocabulary and mastering fundamental grammatical structures, including present and past tense conjugations, particles, and sentence patterns. Students will also develop their understanding of Korean culture and etiquette through weekly cultural events.
Prerequisite: KORA102 or KORA104 or equivalent, as determined by the World Language Placement (WLP).
Restriction: Must not be a native/fluent speaker of Korean; and must be in the Summer Language Institute; and must have permission of the School of Languages, Literatures, and Cultures.
Credit Only Granted for: KORA201 OR KORA203.
Additional Information: Native/fluent speakers of Korean or students who have previously attended school in Korea should take the WLP and see the Korean Program Advisor to identify the correct Korean course for which to register.

KORA204 Intensive Intermediate Korean II (6 Credits)
This course is a continuation of KORA203 or KORA201. This course will focus on developing fluency and accuracy in a wide range of communicative situations. This course introduces more nuanced grammatical structures, including various verb endings, complex sentence constructions, and idiomatic expressions. Emphasis is placed on developing students' narrative skills, presenting their interests, expressing their opinions, and understanding more complex texts and dialogues. Students will also refine their cultural understanding through hands-on experience and lectures.
Prerequisite: KORA201 or KORA203; or equivalent, as determined by the World Language Placement (WLP).
Restriction: Must not be a native/fluent speaker of Korean; and must be in the Summer Language Institute; and must have permission of the School of Languages, Literatures, and Cultures.
Credit Only Granted for: KORA202 or KORA204.
Additional Information: Native/fluent speakers of Korean or students who have previously attended school in Korea should take the WLP and see the Korean Program Advisor to identify the correct Korean course for which to register.

KORA241 History of the Korean Language (3 Credits)
The origins of the Korean language and its development from earliest recorded times to the present. The relationship of Korean to other languages. Taught in English.

KORA269 Special Topics in Study Abroad II (1-6 Credits)
Special topics course taken as part of an approved study abroad program.
Repeatable to: 15 credits if content differs.

KORA345 Korean Language and Linguistics (3 Credits)
An exploration of Korean language and society, in particular the role and nature of the alphabet, Korean sounds, lexical and grammatical structures, and usage in today's South Korea.
Prerequisite: KORA102 or KORA211; or permission of ARHU-School of Languages, Literatures, and Cultures department.

KORA369 Special Topics in Study Abroad III (1-6 Credits)
Special topics course taken as part of an approved study abroad program.
Repeatable to: 15 credits if content differs.

KORA398 Special Topics in Korean Studies (3 Credits)
Study of particular aspect of Korean language, literature, and/or culture. Topic and language of instruction to be announced when course is offered.
Repeatable to: 9 credits if content differs.

KORA499 Independent Study Korean (1-3 Credits)
Independent study under faculty supervision.
Prerequisite: Permission of instructor.
Repeatable to: 6 credits if content differs.

LACS - Latin American and Caribbean Studies

LACS148 Special Topics in Latin American and Caribbean Studies (3 Credits)
Topics to be announced when offered.
Repeatable to: 6 credits if content differs.
Formerly: LASC148.

LACS234 Issues in Latin American and Caribbean Studies I (3 Credits)
Interdisciplinary study of major issues in Latin America and the Caribbean, including Latin America's cultural mosaic, migration and urbanization. Democratization and the role of religions. Taught in English.
Cross-listed with: PORT234, SPAN234.
Credit Only Granted for: LASC234, PORT234, SPAN234, or LACS234.
Formerly: LASC234.

LACS235 Issues in Latin American and Caribbean Studies II (3 Credits)
Major issues shaping Latin American and Caribbean societies including the changing constructions of race, ethnicity, gender and class as well as expressions of popular cultures and revolutionary practices. Taught in English.
Cross-listed with: PORT235, SPAN235.
Credit Only Granted for: LASC235, PORT235, SPAN235, or LACS235.
Formerly: LASC235.

LACS248 Special Topics in Latin American and Caribbean Studies (3 Credits)
Topics to be announced when offered.
Repeatable to: 6 credits.
Formerly: LASC248.

LACS250 History of Colonial Latin America (3 Credits)
Introductory survey of the history of Latin America from pre-Columbian Indian cultures to the beginning of the wars for independence (ca. 1810), covering cultural, political, social, and economic developments. Major themes include conquest, colonialism, indigenous culture, African slavery, religion, race and ethnicity, and gender ideologies.
Cross-listed with: HIST250.
Credit Only Granted for: LASC250, HIST250, OR LACS250.
Formerly: LASC250.

LACS251 Latin America Since Independence (3 Credits)
Introductory survey of the history of Latin America from the era of independence (c. 1810-1825) through the early 1980s. Major themes include independence and sovereignty, postcolonialism and neocolonialism, nation- and state-building, liberalism, citizenship, economic development and modernization, social organization and stratification, race and ethnicity, gender relations, identity politics, reform and revolution, authoritarianism and democratization, and inter-American relations.
Cross-listed with: HIST251.
Credit Only Granted for: HIST251, LASC251, or LACS251.
Formerly: LASC251.

LACS269 Special Topics in Study Abroad II (1-6 Credits)
Special topics course taken as part of an approved study abroad program.
Repeatable to: 15 credits if content differs.
Formerly: LASC269.

LACS286 Internship in Latin American/Caribbean Studies (1-6 Credits)
Internship experience with an organization that works with or studies Latin American and/or the Caribbean. This is an experiential learning course that provides semester-long training that enriches the student's academic field of study and the LASC Certificate. Students submit a final written report of how the experience ties into their major field of study.
Prerequisite: LASC234, SPAN234, LASC235, SPAN235, LACS250, HIST250, LACS251, or HIST251; and permission of Latin American and Caribbean Studies Center required.
Restriction: Minimum cumulative GPA of 2.5; and cannot have more than 60 credits total.
Credit Only Granted for: LASC286 or LACS286.
Formerly: LASC286.
Additional Information: The course is primarily intended for students seeking the Certificate in Latin American and Caribbean Studies, but exceptions will be considered for students with educational or career interests which lie in this area. Student internships must be approved by the Director and students must secure an appropriate faculty mentor to supervise the internship course.

LACS348 Special Topics in Latin American and Caribbean Studies (3 Credits)
Topics to be announced when offered.
Repeatable to: 6 credits if content differs.

LACS348E Caribbean Literature in English (3 Credits)
Political and literary traditions that intersect in the fiction, poetry, and drama written in English by Caribbean writers, primarily during the 20th century.
Cross-listed with: ENGL362.
Credit Only Granted for: ENGL362, LASC348E, or LACS348E.

LACS369 Special Topics in Study Abroad III (1-6 Credits)
Special topics course taken as part of an approved study abroad program.
Repeatable to: 15 credits if content differs.
Formerly: LASC369.

LACS370 Education, Technology and Society: Ecuador in Context (3 Credits)
Set in the UNESCO World Heritage site of Cuenca, Ecuador, students in this short-term study abroad course use theory from Science and Technology Studies (STS) to explore, discuss and critique the design, development and implementation of technology-based social programs in Ecuador. The program looks at education and technology throughout multiple lenses and contexts. Collaboration with the University of Cuenca, participating students have the opportunity for both university and field-based research and practice. UMD students work alongside students and faculty from the leaders and practitioners from UCuenca, government agencies, nongovernmental organizations, small business and local communities.
Recommended: 1 course from (ENES240, ENES200, or ENEE200).
Cross-listed with: ENES359T, CPSS370.
Restriction: Minimum cumulative GPA of 2.5.
Credit Only Granted for: ENES259T, ENES359T, CPSP279T, LASC269T, CPSS370, or LACS370.
Formerly: ENES259T.

LACS448 Special Topics in Latin American and Caribbean Studies (3 Credits)
Intensive study of a selected topic related to Latin American and Caribbean Studies.
Restriction: Junior standing or higher.
Repeatable to: 6 credits if content differs.

LACS458 Senior Capstone Course in Latin American and Caribbean Studies (3 Credits)
Capstone course for advanced students in the Latin American and Caribbean Studies Certificate Program or other students with appropriate preparation. Interdisciplinary topics will vary each semester.
Prerequisite: LACS234 and LACS235; or permission of Latin American and Caribbean Studies Center.
Restriction: Must be in Latin American and Caribbean Studies Certificate program; and senior standing.

LACS486 Internship in Latin American/Caribbean Studies (1-6 Credits)
Internship experience with an organization that works with or studies Latin American and/or the Caribbean. This is an experiential learning course that provides semester-long training that enriches the student's academic field of study and the LACS Certificate. Students submit a final written report of their experience, including critical analysis of the institutional relevance to their major field of study and to Latin American and Caribbean Studies. Students will also be asked to give an oral presentation.
Prerequisite: Permission of Latin American and Caribbean Studies Center required.
Restriction: Minimum cumulative GPA of 2.5; and must have earned a minimum of 60 credits.
Credit Only Granted for: LASC486 OR LACS486.
Formerly: LASC486.
Additional Information: The course is primarily intended for students seeking the Certificate in Latin American and Caribbean Studies, but exceptions will be considered for students with educational or career interests which lie in this area. Student internships must be approved by the Director, and students must secure an appropriate faculty mentor for the internship course. An internship course will be approved only if a faculty supervisor is available.

LACS499 Independent Study in Latin American and Caribbean Studies (1-3 Credits)
Independent Study in Latin American and Caribbean Studies.
Restriction: Permission of instructor.
Repeatable to: 6 credits.
Formerly: LASC499.

LARC - Landscape Architecture

LARC121 Computer Visualization in Design (3 Credits)
Students are provided with the opportunity to 1) explore basic design principles and practice, 2) explore and apply computer concepts and principles, 3) learn and apply basic computer tools used in landscape architecture and allied disciplines, and 4) demonstrate competency in design vocabulary and computer applications through demonstrated deliverables used in the built environment design fields.

LARC131 Computer Visualization I (3 Credits)
Provides the opportunity to 1) explore basic design principles and practice 2) explore and apply computer concepts and principles, 3) learn and apply basic computer tools used in landscape architecture and allied disciplines and 4) demonstrate competency in design vocabulary and computer applications through demonstrated deliverables used in the built environment design fields.
Restriction: Permission of AGNR-Plant Science & Landscape Architecture department; and must be in Landscape Architecture program.
Credit Only Granted for: LARC120 or LARC131.
Formerly: LARC120.

LARC151 Urban Agriculture: Designing and Assessing Edible Landscapes (3 Credits)
Students will examine the growing development of urban agriculture and edible landscapes. Urban agriculture has seen a recent growth and interest in cities across the globe. From Paris to New York, from Baltimore to Detroit, urban agriculture is an emerging land use to address a variety of needs. Redevelopment, food deserts, community engagement and environmental justice are just some of the issues and topics that are connected to the recent growth of urban agriculture. This course will take a critical examination of urban agriculture's contribution to the food system, its input and outputs in the urban landscape, and the planning and design of urban agriculture and edible landscapes.

LARC152 Greening Cities: Who Wins, Who Loses, and Who Cares? (3 Credits)
"Greening Cities" can have many interpretations: improving or adding urban economic activity, realizing energy efficiency, greening urban transport systems, etc. An important component of livable and sustainable cities and metropolitan ecosystems are the plants and landscapes that are inhabited by plants. With the majority of humans now living in cities, a survey of urban ecosystem principles and an examination of design and planning strategies for plant and landscape resources in urban and metropolitan regions is critical.
Credit Only Granted for: LARC152 or PLSC289I.
Formerly: PLSC289I.

LARC160 Introduction to Landscape Architecture and Environmental Design (3 Credits)
History, theory, philosophy and current practice of the profession of landscape architecture. Explores the interactive relationship between humans and their environment by examining people's perceptions of and changing attitude towards the landscape, as well as, an examination of how these are related to ecological and cultural influences. Topics include urban, ecological, community and creative design.

LARC162 Environmental Justice: Same World, Different Built Environment (3 Credits)
Environmental Justice will be explored in the context of the built environment. What unequal public built environmental threats exist? How can these threats be prevented or eliminated? Public schools, public parks, access to clean water, air pollution, tree coverage are among the built environments examined in the course.

LARC188 Special Topics in Landscape Architecture (1-3 Credits)
A lecture course for students interested in Landscape Architecture to cover topics not formally taught in existing courses. An introductory class on a group of closely-related topics for students with an interest in this discipline.
Repeatable to: 6 credits if content differs.

LARC220 Landscape Visualization II (4 Credits)
Basic techniques and application of various media for graphic communication associated with landscape architecture.
Corequisite: LARC230.
Restriction: Permission of AGNR-Plant Science & Landscape Architecture department; and sophomore standing or higher; and must be in Landscape Architecture program.
Credit Only Granted for: LARC489R or LARC220.
Formerly: LARC489R.

LARC221 Digital Design Tools (3 Credits)
The development and application of computing skills as used by the landscape architecture profession. This Computer-Aided Design and Drafting (CADD) course develops computer drafting using a variety of software programs. It also introduces students to Geographic Information Systems (GIS) mapping technologies.
Prerequisite: LARC120 and LARC141.
Recommended: LARC240 and LARC265.
Restriction: Sophomore standing or higher; and must be in Landscape Architecture program.

LARC230 Design Fundamentals Studio (5 Credits)
Introduction to the fundamentals of basic design focusing on creative problem solving associated with landscape architecture. Here you will explore design with different geometries, organizing principles, concept development, spatial definition, land formation, structures and plants. Emphasis will be given on how to represent design ideas using measured drafting techniques and presentation board organization. A series of foundational exercises will culminate in the redesign of a small public space.
Prerequisite: Must have completed or be concurrently enrolled in LARC265 and LARC266.
Corequisite: LARC220.
Restriction: Permission of AGNR-Plant Science & Landscape Architecture department; and sophomore standing or higher; and must be in Landscape Architecture program.
Credit Only Granted for: LARC141 or LARC230.
Formerly: LARC141.

LARC231 Site Planning and Design Studio (5 Credits)
An examination of the influence of landscape character and site features (natural and cultural) on landscape architecture, architecture and planning through application in the studio setting.
Prerequisite: LARC220, LARC265, LARC266, and LARC230.
Corequisite: LARC411 and LARC221.
Restriction: Must be in Landscape Architecture program; and sophomore standing or higher.
Credit Only Granted for: LARC340 or LARC231.
Formerly: LARC340.

LARC240 Graphic Communication and Design Studio (4 Credits)
Exploration of graphic presentation techniques and original concept development for landscape architecture planning and design.
Prerequisite: LARC141 and LARC263.
Corequisite: LARC221 and LARC265.
Restriction: Sophomore standing or higher; and must be in Landscape Architecture program.

LARC263 History of Landscape Architecture (3 Credits)
A survey of landscape architecture history from the ancient Western civilizations to the twentieth century with consideration of parallel developments in the Eastern World, European Africa and the Americas.

LARC265 Site Analysis and Ecological Principles (3 Credits)
Principles and methods of site analysis with an emphasis on the application of ecological principles in landscape architecture, architecture and planning.
Prerequisite: LARC141.
Corequisite: LARC240 and LARC221.
Restriction: Permission of AGNR-Plant Science & Landscape Architecture department; and sophomore standing or higher; and must be in Landscape Architecture program.
Credit Only Granted for: LARC265 or ARCH460.

LARC266 Site and Landscape Ecology Field Studies (1 Credit)
Field Excursions that are essential to apply theory and principles explored in the LARC265 to real world environments.
Prerequisite: Must have completed or be concurrently enrolled in LARC230 or LARC640.
Corequisite: LARC265.
Restriction: Sophomore standing or higher; and must be in Landscape Architecture program.
Additional Information: This course requires field trips.

LARC320 Principles of Site Engineering (3 Credits)
The study and application of landscape construction principles as applied to grading, drainage, site layout, storm water management, and vehicular and pedestrian circulation.
Prerequisite: LARC221.
Corequisite: LARC340.
Restriction: Must be in Landscape Architecture program; and junior standing or higher.

LARC321 Landscape Structures and Materials (3 Credits)
An examination of the use, properties, and detailing of materials used in landscape construction. The use and design of structures in the landscape.
Prerequisite: LARC320; and LARC340.
Restriction: Must be in Landscape Architecture program.
Credit Only Granted for: LARC321 or PLSC321.

LARC330 Urban Design Studio (5 Credits)
The landscape architect's role within the interdisciplinary urban design process, focusing on urban site design issues. Pedestrian friendly site design and the future of sustainable development will be studied.
Prerequisite: LARC411 and LARC231.
Corequisite: LARC412.
Restriction: Junior standing or higher; and must be in Landscape Architecture program.
Credit Only Granted for: LARC330 or LARC440.
Formerly: LARC440.

LARC331 Regional Design and GIS Studio (5 Credits)
An examination of the landscape architect's role within the interdisciplinary regional design field incorporating GIS technologies, spatial modeling, and the regional design process.
Prerequisite: LARC330 and LARC412.
Corequisite: LARC413.
Restriction: Must be in Landscape Architecture program.
Credit Only Granted for: LARC341 or LARC331.
Formerly: LARC341.

LARC388 Honors Thesis Research (3-6 Credits)
Undergraduate honors thesis research conducted under the direction of an AGNR faculty member in partial fulfillment of the requirements of the College of AGNR Honors Program. The thesis will be defended to a faculty committee.
Prerequisite: Must be in the AGNR Honors Program.
Repeatable to: 6 credits if content differs.

LARC389 Internship in Landscape Architecture (3 Credits)
A supervised internship where students earn credit for work experience related to their career goals. Each student must keep a work log, work on a special project, and produce a report related to this project. An evaluation from the external supervisor of the project is required. Participation requires application to the internship advisor in the preceding semester.
Prerequisite: LARC221; and LARC240; and LARC265.
Restriction: Must be in Landscape Architecture program; and junior standing or higher.
Repeatable to: 6 credits.

LARC398 Seminar (1 Credit)

LARC411 Construction Technology I: Principles of Site Engineering (4 Credits)
First of three courses in the landscape architecture engineering and construction sequence that focuses on the principles, procedures, and applications of site grading. Included in this subject area are the topics of relief visualization and representation, slope and contour calculations, grading objectives and methodology, structure siting principles, drainage principles, contour manipulation procedures, stormwater management, horizontal and vertical road alignment, and cut-fill calculations.
Corequisite: LARC231 or LARC641.
Restriction: Must be in Landscape Architecture program.
Credit Only Granted for: LARC320, LARC411 or LARC720.
Formerly: LARC320.

LARC412 Construction Technology II: Materials and Structures (4 Credits)
Second of three courses in the landscape architecture engineering and construction sequence focuses on site construction, soil and water-centric Best Design Practices (BDPs). Included in this subject area are the topics of construction operations and earthwork, soil erosion and sediment control, retaining wall, soil and constructed media, shoreline construction, bioretention and planting systems and green roofs
Prerequisite: LARC411.
Corequisite: LARC330 or LARC642.
Restriction: Must be in Landscape Architecture program.
Credit Only Granted for: LARC321, LARC412 or LARC721.
Formerly: LARC321.

LARC413 Construction Technology III: Water Soil-Centric Practices (4 Credits)
Third of three courses in the landscape architecture engineering and construction sequence focuses on site construction, soil and water-centric Best Design Practices (BDPs). Included in this subject area are the topics of construction operations and earthwork, soil erosion and sediment control, retaining wall, soil and constructed media, shoreline construction, bioretention and planting systems and green roofs.
Prerequisite: LARC412.
Restriction: Must be in Landscape Architecture program.

LARC420 Professional Practice (3 Credits)
An introduction to and comparative study of the professional concerns of design firms. Focus on planning, legal, ethical, marketing and management considerations of interdisciplinary practices.
Prerequisite: LARC321.
Restriction: Must be in Landscape Architecture program.

LARC421 Computer-Aided Design and Drafting (CADD): Urban Construction (3 Credits)
This Computer-Aided Design and Drafting (CADD) course applies computer drafting using AutoCAD. It focuses on providing the technical skills for students who are working in built environment professions. Drawing types may include (but not be limited to) site plan drawings, construction detailing, grading plans, site layout plans and sheet layout conventions.
Credit Only Granted for: LARC489O or LARC421.
Formerly: LARC489O.

LARC430 Community Design Studio (5 Credits)
Studio that emphasizes the integration of critical thinking skills and methodologies introduced throughout the landscape architecture curriculum. Students apply design and analysis methodologies, evaluate alternative solutions, involve community residents and engage in final design development, using the master plan and site design process, report writing, and oral and graphic presentations. Final presentations are open to the university and the community.
Prerequisite: LARC331 and LARC413; and must have completed or be concurrently enrolled in LARC420.
Restriction: Senior standing; and must be in Landscape Architecture program.

LARC440 Urban Design Studio (5 Credits)
The landscape architect's role within the interdisciplinary urban design process, focusing on urban site design issues. Pedestrian friendly site design and the future of sustainable development will be studied.
Prerequisite: LARC321; and LARC340; and LARC341.
Restriction: Must be in Landscape Architecture program.

LARC451 Sustainable Communities (3 Credits)
Explores concepts, strategies and examples of community design which address the needs of a growing population while preserving the environment and its resources.

LARC452 Green Infrastructure and Community Greening (3 Credits)
A critical look and exploration of green infrastructure (GI) elements in the built environment in contributing to ecosystems services and the sustainability of the built environment. The course explores the science, issues, challenges, and the policy, planning and design solutions offered by green infrastructure.
Prerequisite: PLSC110 and PLSC111; or (PLSC112 and PLSC113); or permission of instructor.
Restriction: Junior standing or higher.
Credit Only Granted for: LARC489G or LARC452.
Formerly: LARC489G.

LARC453 Introduction to GIS and Hydrologic Modeling (3 Credits)
Introduction to Geographic Information Systems (GIS) and their application to hydrologic modeling. Basic GIS skills are used to manipulate and analyze spatial data to populate NRCS TR-55 hydrologic model for use in sizing constructed wetlands, bio-retention cells, and minor flood zones. No prior knowledge of GIS or hydrologic modeling is required. Stormwater and erosion control permitting as well as basic design principles for Maryland Environmental Site Design standards are introduced.

LARC454 Principles for Planting Design (3 Credits)
Emphasis will be placed on the analysis of natural systems of the landscape as they relate to visual thinking and to the rigor of the design process. Planting Design will familiarize you with native habitats, reinforce the application of design principles, and assess human response to the built environment in terms of developing a planting scheme. Students will acquire an understanding of and an appreciation for complex, interdependent relationships that exist in a healthy plant community. Students will graphically represent planting plans as communication tools suitable for client and contractor discussion as well as the basic construction documentation process through plant schedules, details, technical specifications, soil analysis, cost estimating, site preparation, and landscape maintenance procedures.
Prerequisite: PLSC253 or equivalent; and LARC220 or LARC620.
Restriction: Permission of Landscape Architecture program; and must be in Landscape Architecture program; or permission of Landscape Architecture program.
Credit Only Granted for: LARC454 or LARC489E.
Formerly: LARC489E.

LARC461 People and the Environment (3 Credits)
Focus is placed on human and environmental interactions. Students will look at both natural and built environments and how they influence human health and well-being. Many environmental settings will be examined. These include hospitals, public housing neighborhoods, school settings, retirement communities, transportation corridors and green spaces. We will also explore how racial and socio-economic factors affect living and working environmental conditions. Ultimately, students will be using this knowledge to create environments that support individuals, families and various community groups' health and well-being.
Credit Only Granted for: LARC489K or LARC461.
Formerly: LARC489K.

LARC470 Landscape Architecture Seminar (3 Credits)
A combination of self-directed study, seminar, and lecture formats. An introduction to aspects of research methods, critical analysis, and proposal writing with a focus on urban and community design.
Prerequisite: LARC321; and LARC341.
Corequisite: LARC440.
Restriction: Senior standing; and must be in Landscape Architecture program.

LARC471 Capstone Praxis Studio (5 Credits)
A capstone experience with projects of varied thematic content that emphasize the integration of critical thinking skills and methodologies introduced throughout the landscape architecture curriculum. Students apply design and analysis methodologies, evaluate alternative solutions, involve community residents and engage in final design development, using the master plan and site design process, report writing, and oral and graphic presentations. Final presentations are open to the university and the community.
Prerequisite: LARC430.
Restriction: Senior standing; and must be in Landscape Architecture program.

LARC489 Special Topics in Landscape Architecture (1-4 Credits)
Credit according to time scheduled and organization of course. A lecture and/or studio course organized as an in-depth study of a selected specialization of landscape architecture not covered by existing courses.
Prerequisite: Permission of AGNR-Plant Science & Landscape Architecture department.
Repeatable to: 4 credits if content differs.

LARC499 Independent Studies in Landscape Architecture (1-4 Credits)
Independent studies in landscape architecture including field, studio or library research under the direction of a faculty member.
Prerequisite: 12 credits in LARC courses; or permission of AGNR-Plant Science & Landscape Architecture department.
Restriction: Must be in Landscape Architecture program; or must be in Plant Sciences program.
Repeatable to: 4 credits if content differs.

LASX - Certificate in Latin American Studies Education Abroad

LASX301 Human Rights and Cultural Representations (3 Credits)
The cultural and human responses to the violence of genocide politics in the Holocaust will serve as an excellent start point to analyze political repression in Latin America (focus on Guatemala, Uruguay, Argentina and Chile). This course discusses not only the impact of trauma, the legacy of memory and the role of the national states during dictatorships in these countries, but also how to make these experiences productive to reconstruct selves and societies.
Additional Information: This course is offered as part of the Maryland-in-Buenos Aires study abroad program. Students must apply for this program through Education Abroad: More information at ter.ps/miba. Education Abroad processes registrations for this course on behalf of students.

LATN - Latin

LATN101 Elementary Latin I (4 Credits)
Additional Information: A student who has two units of Latin in high school may register for LATN101 for the purposes of review, but ordinarily not for credit.

LATN102 Elementary Latin II (4 Credits)
Prerequisite: Must have completed LATN101 at University of Maryland, College Park; or permission of ARHU-Classics department.

LATN201 Intermediate Latin (4 Credits)
Prerequisite: Must have completed LATN102 at University of Maryland, College Park; or permission of ARHU-Classics department.
Formerly: LATN203.

LATN269 Special Topics in Study Abroad II (1-6 Credits)
Special topics course taken as part of an approved study abroad program.
Repeatable to: 15 credits if content differs.

LATN301 Plautus (3 Credits)
Plautine drama. Literary, linguistic and socio-cultural aspects. Readings are in Latin.

LATN302 Ovid (3 Credits)
Major works of Ovidian poetry. Literary and moral atmosphere of Augustan age. Readings are in Latin.

LATN303 Petronius (3 Credits)
Reading and analysis of Petronius' Satyricon with an emphasis on the literary climate of the Neronian Age and on the emergence of the novel as a literary genre. Readings are in Latin.

LATN304 Cicero and Sallust (3 Credits)
Selected speeches of Cicero and selections from the historian Sallust. Rhetorical, social and political context. Readings are in Latin.
Prerequisite: LATN201; or students who have taken courses with comparable content may contact the department.

LATN306 Juvenal (3 Credits)
In the early second century CE, the poet Juvenal composed his Satires, a series of bitterly critical verses railing against the supposed vices of contemporary Roman society. These poems, which are simultaneously deeply conservative and jarringly obscene, comment upon gender, class, sexuality, ethnicity, and politics in often enigmatic ways. Over the course of the semester, we will explore the strange mixture of aggression, self-deprecation, righteousness, and hypocrisy that characterizes Juvenal's poetry. Students will develop their facility with the Latin language, while also familiarizing themselves with the literary, social, and political context in which Juvenal wrote. Students will utilize these linguistic and analytical skills to produce well-argued papers by the end of the semester.
Prerequisite: LATN201; or equivalent.

LATN351 Horace and Catullus (3 Credits)
Readings are in Latin.
Prerequisite: LATN201; or students who have taken courses with comparable content may contact the department.

LATN369 Special Topics in Study Abroad III (1-6 Credits)
Special topics course taken as part of an approved study abroad program.
Repeatable to: 15 credits if content differs.

LATN386 Experiential Learning (3-6 Credits)
Prerequisite: Must have a Learning Proposal approved by the Office of Experiential Learning Programs, faculty sponsor, and student's internship sponsor.
Restriction: Junior standing or higher.

LATN388 Special Topics in Latin Language and Literature (3 Credits)
Readings in Latin at the intermediate level.
Prerequisite: LATN201; or permission of the department.
Repeatable to: 6 credits if content differs.

LATN405 Lucretius (3 Credits)
Readings are in Latin.

LATN410 Latin Historians (3 Credits)
Latin historical writing as a literary genre. Influences, style, and literary techniques. Readings are in Latin.

LATN415 Vergil's Aeneid (3 Credits)
Vergil's Aeneid: readings of selections in Latin and of the entire epic in English translation along with critical essays.
Formerly: LATN305.

LATN472 Historical Development of the Latin Language (3 Credits)
An analysis of the development of the Latin language from archaic times to the Middle Ages.
Credit Only Granted for: LATN472 or LING431.

LATN488 Latin Readings (3 Credits)
The reading of one or more selected Latin authors from antiquity through the Renaissance. Reports.
Prerequisite: Permission of ARHU-Classics department.
Repeatable to: 6 credits if content differs.
Additional Information: Readings are in Latin.

LATN499 Independent Study in Latin Language and Literature (1-3 Credits)
Prerequisite: Permission of ARHU-Classics department.
Repeatable to: 6 credits if content differs.

LBSC - Library Science

LBSC208 Special Topics in Information Studies (3 Credits)
Special topics in aspects of information use, technology, and policy.
Repeatable to: 6 credits if content differs.

LBSC386 Experiential Learning (3-6 Credits)
Restriction: Junior standing or higher; and must have learning proposal approved by the Office of Experiential Learning Programs, faculty sponsor, and student's internship sponsor.

LBSC499 Workshops, Clinics, and Institutes (1-9 Credits)
Workshops, clinics, and institutes developed around specific topics or problems. Primarily for practicing librarians.
Repeatable to: 9 credits.

LEAD - Leadership Education and Development

LEAD217 Introduction to Leadership (3 Credits)
Surveys the study and practice of leadership and provides students with a variety of experiences to wrestle with large leadership questions. What is leadership? Who can be a leader? How is leadership an important aspect of understanding self and others? Students will explore and respond to these questions through a variety of leadership theories and models, self-assessments, critical reflection, active-learning, group projects, and research. The course will introduce students to critical theory and critical perspectives of leadership to help students broaden their perspectives on leadership and develop more complex thought and practice of leadership.
Restriction: Freshman standing; or sophomore standing.
Credit Only Granted for: LEAD217 or HESI217.
Formerly: HESI217.

LEAD305 Leadership and Ethics (3 Credits)
Encourages students to explore the ethical demands of leadership. Through the examination of moral and ethical frameworks, students will develop their efficacy in analyzing multiple perspectives, decision-making, and navigating complexity. This course focuses on values-based leadership and one's responsibilities and commitments in the context of leadership for the common good and for purposeful change. The course assists students in identifying and examining ethical leadership as it relates to values, authenticity, context, controversy, and dilemmas.

LEAD315 Leadership in Groups and Organizations (3 Credits)
Assists students in acquiring and integrating leadership knowledge within group and organizational contexts. Individual (self), relational (others), and contextual (context) influences on leadership will be examined using theories and frameworks that will help students learn to navigate complex organizational environments and practice leadership that is process-based and relationship-oriented. Through hands-on activities, personal exploration, and critical analysis of leadership within groups and organizations, students will gain greater insight into the historical, cultural, and environmental elements of leadership.
Prerequisite: LEAD217 or HESI217.
Credit Only Granted for: LEAD315 or HESI315.
Formerly: HESI315.

LEAD320 Social Action Seminar (2 Credits)
The purpose of the Social Action Sequence (LEAD 320 & LEAD 321) is to examine the connections between leadership and social change, and learn how our own leadership knowledge and practice can be used to advance progress toward more just and equitable communities. In LEAD 320 (2-credits), students will have the opportunity to conduct a semester-long project to increase their knowledge and understanding of a social issue of their interest, and design resources and an action plan for engaging in work related to this social issue in their own communities.
Prerequisite: HESI217 or LEAD 217; and HESI315 or LEAD315.
Restriction: Must be in the Leadership Studies Minor or Leadership Studies Certificate program.
Credit Only Granted for: HESI320 or LEAD320.
Formerly: HESI320.
Additional Information: May fulfill a requirement for the Leadership Studies Certificate only if taken sequentially with LEAD321 course.

LEAD321 Advanced Social Action Seminar (1 Credit)
The purpose of the Social Action Sequence (LEAD 320 & LEAD 321) is to examine the connections between leadership and social change, and learn how our own leadership knowledge and practice can be used to advance progress toward more just and equitable communities. Together we will explore socially-responsible approaches to leadership as the groundwork for this sequence. In LEAD 321 (1-credit), students will implement their action plan for regular engagement in their community related to their chosen social issue, practicing leadership approaches and skills to advance social change within their spheres of influence.
Prerequisite: HESI217 or LEAD217; and HESI315 or LEAD315; and HESI320 or LEAD320.
Restriction: Must be in the Leadership Studies Minor or Leadership Studies Certificate program.
Credit Only Granted for: HESI321 or LEAD321.
Formerly: HESI321.
Additional Information: May fulfill a requirement for Leadership Studies Certificate only if taken sequentially with LEAD 320 course.

LEAD417 Leadership Studies Capstone (3 Credits)
As the final academic experience in the Leadership Studies Minor/Certificate, this seminar is designed to be both retrospective and integrative, encouraging you to synthesize relevant concepts and experiences and to formulate your own informed perspective on the implications of leadership. This course will serve as a place to critically think about the field of leadership studies and the implications of leadership in multiple settings for life-long practice. You will be expected to demonstrate skill in analysis of pertinent literature, write with purpose and clarity, facilitate the learning and development of others, and engage in thoughtful group discussion. In this seminar, you will submit scholarly products to demonstrate a mature understanding of your leadership trajectory in past, present and future contexts.
Prerequisite: HESI217 or LEAD217; and HESI315 or LEAD315.
Restriction: Permission of Counseling, Higher Education, and Special Education department required; Restricted to students in Leadership Studies Minor and Certificate only .
Credit Only Granted for: LEAD417 or HESI417.
Formerly: HESI417.

LGBT - Lesbian Gay Bisexual Transgender Studies

LGBT200 Introduction to Lesbian, Gay, Bisexual, and Transgender Studies (3 Credits)
An interdisciplinary study of the historical and social contexts of personal, cultural and political aspects of LGBT life. Sources from a variety of fields, such as anthropology, history, psychology, sociology, and women's studies, focusing on writings by and about LGBT people.
Credit Only Granted for: LGBT200.

LGBT264 Quare/Queer Contentions: Exploration of Sexualities in the Black Community (3 Credits)
Centering the subjectivities of queer people of color generally and more specifically, Black people (as the word "quare" invites us to do), Quare/Queer Contentions takes up key moments within the history of the Black community and asks us to consider the work and presence of LGBTQ people in these moments. The course also contends with the everyday experiences of LGBTQ subjects in the Black community. Quare/Queer Contentions, therefore, interrogates the material realities of Black queer people in the context of family, religion, cultural/creative work, among others. Interdisciplinary in orientation, the course will employ primary and secondary texts, film, art, autobiographical narratives and policy data.
Cross-listed with: AAAS264, WGSS264.
Credit Only Granted for: LGBT264, AASP264, AAAS264, WMST264 or WGSS264.

LGBT265 LGBTQ+ Literatures and Media (3 Credits)
A study of literary and cultural expressions of queer and trans identities, positionalities, and analytics through an exploration of literature, art, and media. We will examine historical and political power relations by considering the intersections of sexuality and gender with race, class, nation, and disability. Topics include the social construction and regulation of sexuality and gender, performance and performativity, intersectionality, and the relationship between aesthetic forms and queer/trans subjectivity. Our interpretations will be informed by queer and trans theories.
Cross-listed with: ENGL265.
Restriction: Must not have completed LGBT265.
Credit Only Granted for: ENGL265 or LGBT265.

LGBT298 Special Topics in Lesbian, Gay, Bisexual, and Transgender Studies (3 Credits)
Study of particular themes and issues in LGBT studies.
Repeatable to: 9 credits if content differs.

LGBT310 Transgender Studies (3 Credits)
Introduces students to the interdisciplinary field of transgender studies, providing a history of the field and engaging current debates within it. Students will explore the emergence and consolidation of trans identities, practices, cultures, and knowledges across medical, historical, sociological, cultural, and artistic contexts, paying particular attention to dynamics of race, class, and ability, to global and transnational difference, and to the implications of transgender studies for understanding gender and sexuality overall.
Prerequisite: LGBT200 .
Cross-listed with: WGSS310.
Credit Only Granted for: LGBT310, WMST310 or WGSS310.

LGBT327 Lesbian, Gay, Bisexual, and Transgender Film and Video (3 Credits)
Comparative analysis of forms, themes, and the politics of representation in film and video by and/or about LGBT people.
Cross-listed with: ENGL359F.
Restriction: Junior standing or higher.
Credit Only Granted for: LGBT327 or ENGL359F.

LGBT350 LGBTQ+ Public Speaking and Facilitation (3 Credits)
Guides students through oral communication skills around LGBTQ+ topics. The course centers the experiences of minoritized intersectional LGBTQ+ communities, and students will use speaking, presentation, and facilitation skills to educate the UMD community about sexual orientation and gender identity and expression through panel discussions in classes, residence halls, and other university settings. Students who have received training for this purpose enter into these discussions prepared to disseminate accurate information, to answer questions that students, staff, and faculty may have about the realities of LGBTQ+ lives. Students will receive training that is rooted in queer theory and social justice education, building on the prerequisite course LGBT 200.
Prerequisite: LGBT200.
Restriction: Must have permission of LGBT Studies Program.

LGBT359 Special Topics in LGBTQ+ Literatures and Media (3 Credits)
Selected study of a topic pertinent to literary and cultural expressions of LGBTQ+ identities, positionalities, and analytics through an exploration of literature, art, and/or media.
Cross-listed with: ENGL359.
Repeatable to: 9 credits if content differs.

LGBT386 Lesbian, Gay, Bisexual, and Transgender Community Organization Internship (3-6 Credits)
Supervised internship experience with a community organization that expressly serves lesbian, gay, bisexual, and transgender people. Students will be expected to relate course material to experience in an analysis of an organization's activities.
Prerequisite: 9 credits in LGBT courses.
Restriction: Permission of LGBT Studies Program.

LGBT398 Special Topics in Lesbian, Gay, Bisexual, and Transgender Studies (3 Credits)
In-depth study of particular themes and issues in LGBT studies.
Prerequisite: LGBT200.
Restriction: Sophomore standing or higher.
Repeatable to: 9 credits if content differs.

LGBT448 Special Topics in Lesbian, Gay, Bisexual, and Transgender Studies (3 Credits)
In-depth study of particular themes and issues in LGBT studies.
Prerequisite: LGBT200; or permission of LGBT Studies Program.
Restriction: Junior standing or higher.
Repeatable to: 9 credits if content differs.

LGBT448W Sex, Gender, and Jewish Identity (3 Credits)
An exploration of Jewish embodiment, including dynamics related to biological sex, culturally-framed gender, and sexuality. Topics of discussion may include transgender and intersex Jews, stereotypes and gender performance, modesty, genetics, and body alteration. Focus is on contemporary Jewish culture, framed within the larger historical and textual tradition.
Prerequisite: 1 course in WGSS; or 1 course in JWST; or 1 course in LGBT; or permission of instructor.
Cross-listed with: JWST492, WGSS492.
Credit Only Granted for: JWST492, JWST409G, LGBT448W, WMST498W or WGSS492.
Formerly: WMST498W and JWST409G.

LGBT459 Selected Topics in Sexuality and Literature (3 Credits)
Detailed study of sexuality as an aspect of literary and cultural expression.
Prerequisite: Must have completed two lower-level English courses, at least one in literature.
Repeatable to: 9 credits if content differs.

LGBT488 Seminar in Lesbian, Gay, Bisexual, and Transgender Studies (1-3 Credits)
Developments in theories and methods of LGBT Studies, with emphasis upon interaction between the humanities and the social sciences in the elaboration of this interdisciplinary area of scholarship.
Prerequisite: 9 credits in LGBT courses; and permission of LGBT Studies Program.
Recommended: LGBT200. And ENGL265; or CMLT291.
Repeatable to: 9 credits if content differs.
Formerly: CMLT498Y.

LGBT499 Independent Study (1-3 Credits)
Directed research and analysis in LGBT Studies on a topic selected by the student.
Prerequisite: LGBT200; and permission of LGBT Studies Program.
Restriction: Senior standing.
Repeatable to: 6 credits if content differs.

LGBX - Lesbian Gay Bisexual Transgender Studies Education Abroad

LGBX200 Gender, Equality, and Sexuality in Scandinavia (3 Credits)
Sweden is one of the most gender equal countries in the world and is well-known for its progressive culture supported by forward-thinking laws and legislation. This course explores how concepts of gender, body, sexuality and race intersect in current debates about changing family structures, children's rights, and new ethical dilemmas in a changing Scandinavia.
Cross-listed with: WMSX200.
Credit Only Granted for: WMSX200 or LGBX200.
Additional Information: This course is offered as part of the Maryland-in-Stockholm study abroad program. Students must apply for this program through Education Abroad: More information at ter.ps/UMStockholm. Education Abroad processes registrations for this course on behalf of students.

LGBX201 Sex Education and Sexual Reform in Europe (3 Credits)
Provides insight to the ways in which sexual reform and sex education has shaped not only the history of sexuality in Europe, but also the very core of the various national identities. We will look into the different movements, campaigns, policies, and public debates regarding sexuality. We will discover the ways in which sex and sexuality are conveyed in sexual education aimed at children and youth by reading and watching examples of sex educational material.
Cross-listed with: WMSX201.
Credit Only Granted for: WMSX201 or LGBX201.
Additional Information: This course is offered as part of the Maryland-in-Stockholm study abroad program. Students must apply for this program through Education Abroad: More information at ter.ps/UMStockholm. Education Abroad processes registrations for this course on behalf of students.

LGBX202 Transgender in Scandinavia (3 Credits)
This course explores the history of trans activism with a special focus on Sweden, and how legislative and medical discourses change how we think about gender identities and rights. We also explore topics such as transphobia, gender disclosure and HIV criminalization laws, reproductive rights, gender-neutral pronouns, transgender children and their families, and how race and class intersect with being trans.
Cross-listed with: WMSX202.
Credit Only Granted for: WMSX202 or LGBX202.
Additional Information: This course is offered as part of the Maryland-in-Stockholm study abroad program. Students must apply for this program through Education Abroad: More information at ter.ps/UMStockholm. Education Abroad processes registrations for this course on behalf of students.

LING - Linguistics

LING200 Introductory Linguistics (3 Credits)
An exploration of the nature of human language. Introduction to the basic concepts and methodology of modern linguistic analysis (sound systems, word formation, sentence structure). Examination of the factors that contribute to dialect differences and the social implications of language variation. Additional topics may include: semantics, pragmatics, language change, writing systems, typology, language universals, comparison with other communication systems.
Credit Only Granted for: HESP120 or LING200.
Additional Information: This course serves as the prerequisite for further courses in linguistics.

LING240 Language and Mind (3 Credits)
The study of language as a cognitive phenomenon. Ways of representing people's knowledge of their native language, ways in which that knowledge is attained naturally by children, and how it is used in speaking and listening. Additional topics may include: animal communication, language and the brain, language and thought.
Prerequisite: Minimum grade of C- in LING200.
Additional Information: Required for Linguistics majors and recommended for students in related fields.

LING248 Introduction to Laboratory Research in Linguistics (2-3 Credits)
Individualized, collaborative research course aimed at developing skills for laboratory research in language acquisition, sentence processing or neurolinguistics. Learning to conduct research in laboratory linguistics as part of a research team that will create original research in the field.
Recommended: LING200 or LING240.
Restriction: Permission of instructor.
Repeatable to: 6 credits if content differs.
Additional Information: A two-semester commitment is required, i.e. Ling248 is followed by Ling448.

LING260 Meaning through Language: Why are we so good at it? (3 Credits)
What is it about us humans and our languages that allows us to communicate in ways unmatched by other animals or powerful AI models? The question is ancient, but recent decades have seen great progress in the cognitive science of language, while expanding the diversity of languages investigated. We know much more about how languages vary, how they develop in children, how they are encoded in the mind, and relate to other domains of cognition. Major developments in statistical computation and research on animal cognition also illuminate what is (not) possible without the particular structure of the human mind. We bring this all to bear on our Big Question: What makes human language special from the viewpoint of meaning? Students will come to understand the major features of language as a vehicle for complex thought and a tool for communication. They will use this understanding in analyzing common semantic patterns and everyday conversational dynamics.

LING262 HERITAGE LANGUAGES AND THEIR SPEAKERS (3 Credits)
An interdisciplinary examination of the phenomenon of heritage language (a bilingual's home language which is distinct from the dominant language of the wider society). Relationship between linguistic structure, cultural and social aspects of language use, and language change. Interpretations of experimental and theoretical work. Relevance of heritage languages for linguistic theory, language policy, and education.
Additional Information: One class per week will be in-field instruction in collecting data from heritage speakers.

LING269 Special Topics in Study Abroad II (1-6 Credits)
Special topics course taken as part of an approved study abroad program.
Repeatable to: 15 credits if content differs.

LING272 Biophysics of Language (3 Credits)
Can my dog ask questions - and how would my cat answer? A traditional debate concerns whether language is a unique human faculty. While communication systems are common - cetaceans whistle and sing, songbirds and parrots are vocal learners, bees convey information about energy sources - the specific properties of human language, involving finite mental means to socially yield unbounded messages, have not been easy to find in other species. This course delves into the question of whether this quality is unique to humans. The only precondition to take it is the willingness to approach the matter scientifically, starting with notions from a Computational Theory of Mind. Students may bring to bear upon these questions insights from linguistics, psychology, neuroscience, molecular biology, etc., to debate how an abstract systematic behavior can arise within an animal brain, and what that says about evolution.
Cross-listed with: HNUH248D.
Credit Only Granted for: HNUH248D or LING272.

LING311 Syntax I (3 Credits)
Basic concepts, analytical techniques of generative syntax, relation to empirical limits imposed by viewing grammars as representations of a component of human mind. Aspects of current theories.
Prerequisite: LING240.

LING312 Syntax II (3 Credits)
Continuation of LING311. Development of theories of syntax. Criteria for revising theories. Methods and strategies of scientific efforts to explain natural phenomena.
Prerequisite: LING311.

LING320 Phonetics (3 Credits)
Representations and models of acoustic and articulatory phonetics. Develops concepts and skills for description, measurement and scientific analysis of the sound systems of human languages, including various varieties of English.
Prerequisite: Minimum grade of C- in LING200 or LING240.
Additional Information: This course counts as a core course for the linguistics major. Only one of Ling320 or HESP403 can be used to count towards the Linguistics major.

LING321 Phonology I (3 Credits)
Properties of sound systems of human languages, basic concepts and analytical techniques of generative phonology. Empirical limits imposed by viewing grammars as cognitive representations. Physiological properties and phonological systems; articulatory phonetics and distinctive feature theory.
Prerequisite: LING240.

LING322 Phonology II (3 Credits)
Continuation of LING321. Further investigation of phonological phenomena and phonological theory. Revising and elaborating the theory of the phonological representation; interaction of phonology and morphology.
Prerequisite: LING321.

LING330 Historical Linguistics (3 Credits)
A traditional presentation of language change. Language types and families, sounds and writing systems, grammatical categories. Reconstruction of proto-languages by internal and comparative methods.
Prerequisite: LING321.
Recommended: LING311.

LING350 Philosophy of Language (3 Credits)
The nature and function of language and other forms of symbolism from a philosophical perspective.
Prerequisite: LING311; or 2 courses in PHIL and (PHIL170 or PHIL370); or permission of ARHU-Philosophy department.
Cross-listed with: PHIL360.
Credit Only Granted for: LING350 or PHIL360.

LING369 Special Topics in Study Abroad (1-6 Credits)
Special topics course taken as part of an approved study abroad program.
Repeatable to: 15 credits if content differs.

LING386 Experiential Learning (3-6 Credits)
Prerequisite: Must have a Learning Proposal approved by the Office of Experiential Learning Programs, faculty sponsor, and student's internship sponsor.
Restriction: Junior standing or higher.

LING410 Grammar and Meaning (3 Credits)
The basic notions of semantic theory: reference, quantification, scope relations, compositionality, thematic relations, tense and time, etc. The role these notions play in grammars of natural languages. Properties of logical form and relationship with syntax.
Prerequisite: Permission of instructor; or LING311.

LING419 Topics in Syntax (3 Credits)
Topics vary.
Prerequisite: LING311.
Repeatable to: 12 credits if content differs.

LING420 Word Formation (3 Credits)
Examination of shape and meaning of possible words, both across languages and within particular languages. Interaction between principles of word formation and other components of a grammar: syntax, logical form and phonology.
Prerequisite: LING321 and LING311.

LING429 Topics in Phonology (3 Credits)
Advanced seminar in phonology. Topics vary.
Prerequisite: LING322.
Repeatable to: 6 credits if content differs.

LING439 Topics in Diachronic Linguistics (3 Credits)
Repeatable to: 6 credits if content differs.

LING440 Grammars and Cognition (3 Credits)
Relationship between the structure, development and functioning of grammars and the structure, development and functioning of other mental systems. Interpretations of experimental and observational work on children's language, aphasia, speech production and comprehension.
Prerequisite: LING321 and LING311.

LING444 Child Language Acquisition (3 Credits)
Examines language acquisition in infancy and early childhood: the nature of children's linguistic representations and how these develop naturally. Role of (possible) innate linguistic structure and interaction of such structure with experience. Evaluation of methods and results of current and classic research leading to contemporary models of language development.
Prerequisite: LING311.

LING448 Advanced Laboratory Research in Linguistics (2-3 Credits)
Individualized, collaborative research course aimed at developing skills for laboratory research in language acquisition, sentence processing or neurolinguistics. Conducting a research project in laboratory linguistics as part of a team creating original research relevant to current issues in linguistics.
Prerequisite: LING248; and (LING200 or LING240).
Restriction: Permission of instructor.
Repeatable to: 6 credits if content differs.
Additional Information: This course is part of a two-semester sequence. Ling248 is a prerequisite. Ling248 and Ling448 must be completed in the same laboratory.

LING449 Topics in Psycholinguistics (3 Credits)
Critical evaluation of primary research in psycholinguistics. Relating theoretical hypotheses to experimental hypotheses and predictions. Evaluation of experimental results. Emphasis on hands-on experience and experimental methodologies. Specific topics vary.
Prerequisite: LING321 and LING311; or permission of ARHU-Linguistics department.
Repeatable to: 6 credits if content differs.

LING451 Grammars and Variation (3 Credits)
Grammars and the use of language in a variety of styles: formal, casual, literary, etc. Consequences for concepts of grammars. Variation theory. Literary styles.
Prerequisite: LING311.

LING460 Diversity and Unity in Human Languages (3 Credits)
Fundamentals of grammatical typology as they relate to issues in social attitudes towards language. Linguistic structure of standard and non-standard languages and dialects. Relationship of different writing systems to linguistic structure. Issues in bilingualism and multilingualism.
Prerequisite: LING240 or LING200.

LING499 Directed Studies in Linguistics (1-3 Credits)
Independent study or research on language under the supervision of a faculty member.
Prerequisite: Permission of ARHU-Linguistics department.
Repeatable to: 6 credits if content differs.

MATH - Mathematics

MATH107 Introduction to Math Modeling and Probability (3 Credits)
A goal is to convey the power of mathematics as shown by a variety of problems which can be modeled and solved by quantitative means. Also included is an introduction to probability. Topics include data analysis, equations, systems of equations, inequalities, elementary linear programming, Venn diagrams, counting, basic probability, permutations, combinations, tree diagrams, standard normal and normal distributions. The mathematics of finance is covered. The course includes problem solving and decision making in economics, management, and social sciences.
Prerequisite: Must have math eligibility of MATH107 or higher; and math eligibility is based on Math Placement Exam or successful completion of MATH003 with appropriate eligibility.
Restriction: Not open to students majoring in mathematics, engineering, business, life sciences, and the physical sciences; must not have completed STAT100, MATH113, MATH120, MATH135, MATH136 or MATH140 with a C- or better; must not have completed any MATH or STAT course with a prerequisite of MATH120, MATH136, or MATH140.
Formerly: MATH110 and MATH111.

MATH113 College Algebra and Trigonometry (3 Credits)
Topics include elementary functions including graphs and applications of: polynomial, rational, exponential, and logarithmic functions. Systems of equations and applications. Trigonometric functions: angle and radian measure, graphs and applications.
Prerequisite: Must have math eligibility of MATH113 or higher; and math eligibility is based on the Math Placement Exam or the successful completion of MATH 003 with appropriate eligibility.
Restriction: Must not have completed MATH115, MATH120, MATH135, MATH136 or MATH140 with a grade of C- or higher; and must not have completed any course with a prerequisite of MATH120, MATH130, MATH136, or MATH140.

MATH115 Precalculus (3 Credits)
Preparation for MATH120, MATH135 or MATH140. Elementary functions and graphs: polynomials, rational functions, exponential and logarithmic functions, trigonometric functions. Algebraic techniques preparatory for calculus.
Prerequisite: Must have math eligibility of MATH115 or higher; and math eligibility is based on the Math Placement Exam or the successful completion of MATH003 with appropriate eligibility. Or MATH113.
Restriction: Must not have completed MATH140 with a grade of C- or better; and must not have completed any MATH or STAT course with a prerequisite of MATH140 or MATH141.

MATH120 Elementary Calculus I (3 Credits)
Basic ideas of differential and integral calculus, with emphasis on elementary techniques of differentiation and applications.
Prerequisite: 1 course with a minimum grade of C- from (MATH113, MATH115). Or must have math eligibility of MATH120 or higher; and math eligibility is based on the Math Placement Test.
Restriction: Not open to students majoring in mathematics, engineering, the biological sciences, biochemistry, chemistry, or the physical sciences; Must not have completed MATH130, MATH136 or MATH140 with a grade of C- or higher.
Formerly: MATH220.

MATH121 Elementary Calculus II (3 Credits)
Trigonometric functions, techniques of integration, infinite series, differential equations, probability.
Prerequisite: MATH120, MATH130, MATH136, or MATH140.
Restriction: Not open to students majoring in mathematics, engineering, the biological sciences, biochemistry, chemistry, or the physical sciences; Must not have completed MATH141 with a grade of C- or higher.
Formerly: MATH221.

MATH135 Discrete Mathematics for Life Sciences (4 Credits)
Basic discrete mathematics, with emphasis on relevant models and techniques to the life sciences.
Prerequisite: Minimum grade of C- in MATH113 or MATH115; or must have math eligibility of MATH120 or higher; and math eligibility is based on the Math Placement Test.
Restriction: Must be in the Biological Sciences or Neuroscience major; and not open to students majoring in mathematics, engineering, or the physical sciences.

MATH136 Calculus for Life Sciences (4 Credits)
Continuation of MATH135, including basic ideas of differential and integral calculus, with emphasis on elementary techniques and applications to the life sciences.
Prerequisite: Minimum grade of C- in MATH135.
Restriction: Must be in the Biological Sciences or Neuroscience major; Must not have completed MATH140 with a grade of C- or higher.

MATH140 Calculus I (4 Credits)
Introduction to calculus, including functions, limits, continuity, derivatives and applications of the derivative, sketching of graphs of functions, definite and indefinite integrals, and calculation of area. The course is especially recommended for science, engineering and mathematics majors.
Prerequisite: Minimum grade of C- in MATH115; or must have math eligibility of MATH140; and math eligibility is based on the Math Placement Test.

MATH141 Calculus II (4 Credits)
Continuation of MATH140, including techniques of integration, improper integrals, applications of integration (such as volumes, work, arc length, moments), inverse functions, exponential and logarithmic functions, sequences and series.
Prerequisite: Minimum grade of C- in MATH140.

MATH199 Special Topics in Mathematics (3 Credits)
Many games have a mathematical component. We will introduce several games, play them, and investigate the underlying mathematics. Students will work in teams on projects that involve developing strategies for new games.
Prerequisite: Permission of CMNS-Mathematics department.

MATH206 Introduction to Matlab (1 Credit)
This course is intended to prepare students for subsequent courses requiring computation with MATLAB. Covers basics of MATLAB including simple commands, variables, solving equations, graphing differentiation and integration, matrices and vectors, functions, M-files and fundamentals of programming in the MATLAB environment. When offered in Winter and Summer terms, the course is offered in a format suitable for online distance learning.
Prerequisite: 1 course with a minimum grade of C- from (MATH136, MATH140).

MATH212 Elements of Numbers and Operations (3 Credits)
Reviews and extends topics of arithmetic and number theory related to the elementary school curriculum, particularly number systems and operations with natural numbers, integers, and rationals.
Prerequisite: Must have completed one year of college preparatory algebra.
Restriction: Must be in one of the following programs (Early Childhood Education; Special Education; Elementary Education; Middle School Education).

MATH213 Elements of Geometry and Measurement (3 Credits)
Properties of geometric objects in two and three dimensions; parallel lines, curves and polygons; ratio, proportion, similarity; transformational geometry and measurement, constructions, justifications and proofs.
Prerequisite: MATH212.
Restriction: Must be in one of the following programs (Early Childhood Education; Special Education; Elementary Education; Middle School Education).

MATH214 Elements of Probability and Statistics (3 Credits)
Permutations and combinations; probability; collecting and representing data; using statistics to analyze and interpret data.
Prerequisite: MATH212.
Restriction: Must be in one of the following programs (Early Childhood Education; Special Education; Elementary Education; Middle School Education).

MATH240 Introduction to Linear Algebra (4 Credits)
Basic concepts of linear algebra: vector spaces, applications to line and plane geometry, linear equations and matrices, similar matrices, linear transformations, eigenvalues, determinants and quadratic forms.
Prerequisite: 1 course with a minimum grade of C- from (MATH131, MATH141).
Credit Only Granted for: MATH240, MATH341, or MATH461.

MATH241 Calculus III (4 Credits)
Introduction to multivariable calculus, including vectors and vector-valued functions, partial derivatives and applications of partial derivatives (such as tangent planes and Lagrange multipliers), multiple integrals, volume, surface area, and the classical theorems of Green, Stokes and Gauss.
Prerequisite: Minimum grade of C- in MATH141.
Credit Only Granted for: MATH241 or MATH340.

MATH243 Introduction to Linear Algebra and Differential Equations (4 Credits)
The basics of linear algebra and differential equations, with an emphasis on general physical and engineering applications. Aimed at students who need the material for future coursework but do not need as much depth and rigor as provided by MATH240 and MATH246.
Prerequisite: Minimum grade of C- in MATH141.
Credit Only Granted for: ENEE290 or MATH243.
Additional Information: Does not satisfy requirements for the Mathematics or Computer Science major. Does not satisfy prerequisite requirements for courses requiring MATH240 or MATH246.

MATH246 Differential Equations for Scientists and Engineers (3 Credits)
An introduction to the basic methods of solving ordinary differential equations. Equations of first and second order, linear differential equations, Laplace transforms, numerical methods and the qualitative theory of differential equations.
Prerequisite: Minimum grade of C- in MATH141.
Credit Only Granted for: MATH246 or MATH341.

MATH274 History of Mathematics (3 Credits)
An overview of aspects in the history of mathematics from its beginning in the concrete problem solving of ancient times through the development of abstraction in the 19th and 20th centuries. The course considers both mathematical ideas and the context in which they developed in various civilizations around the world.
Prerequisite: MATH120, MATH130, MATH136, or MATH140; or must have completed MATH220.

MATH299 Selected Topics in Mathematics (1-3 Credits)
Topics of special interest under the general guidance of the departmental committee on undergraduate studies.
Prerequisite: Permission of CMNS-Mathematics department.

MATH310 Introduction to Mathematical Proof (3 Credits)
To develop the students' ability to construct a rigorous proof of a mathematical claim. Students will also be made aware of mathematical results that are of interest to those wishing to analyze a particular mathematical model. Topics will be drawn from logic, set theory, structure of the number line, elementary topology, metric spaces, functions, sequences and continuity.
Prerequisite: Minimum grade of C- in MATH141; and must have completed or be concurrently enrolled in MATH240, MATH341, or MATH461; and must have completed or be concurrently enrolled in MATH241 or MATH340.
Restriction: Must be in a major within the CMNS-Mathematics department; or must be in the Mathematics minor within the CMNS-Mathematics department; or permission of the CMNS-Mathematics department.
Additional Information: Math majors may not use this course to satisfy an upper-level requirement.

MATH312 Mathematical Reasoning and Proof for Pre-Service Middle School Teachers (3 Credits)
Reasoning and proof as addressed in the middle school curriculum. Topics include proportional reasoning, logic and proof, types of numbers, field axioms, Euclidean and non-Euclidean geometry.
Prerequisite: MATH212 and MATH213.
Restriction: Must be in one of the following programs (Elementary Education; Special Education; Middle School Education).

MATH314 Introduction to Probability, Data, Analysis and Statistics for Preservice Middle School Teachers (3 Credits)
Analysis of bivariate data, probability and randomness, law of large numbers, central limit theorem, probabilities for independent and dependent events, counting techniques, random variables and probability distributions, expected values, sampling distributions, and confidence intervals.
Prerequisite: MATH214.
Restriction: Must be in one of the following programs (Elementary Education; Special Education; Middle School Education).

MATH315 Algebra for Preservice Middle School Teachers (3 Credits)
Algebraic concepts and techniques developed in the middle grades, with their larger mathematical context. Equations, inequalities and functions (linear, polynomial, exponential, logarithmic), with multiple representations of relationships. Common misconceptions of beginning algebra students.
Prerequisite: MATH212.
Restriction: Must be in one of the following programs (Elementary Education; Special Education; Middle School Education).

MATH340 Multivariable Calculus, Linear Algebra and Differential Equations I (Honors) (4 Credits)
First semester of the MATH340-341 sequence which gives a unified and enriched treatment of multivariable calculus, linear algebra and ordinary differential equations, with supplementary material from subjects such as differential geometry, Fourier series and calculus of variations. Students completing MATH340-341 will have covered the material of MATH240, MATH241, and MATH246, and may not also receive credit for MATH240, MATH241 or MATH246.
Prerequisite: MATH141 and MATH140; and permission of CMNS-Mathematics department; and permission will be granted only to incoming freshmen.
Credit Only Granted for: MATH241 or MATH340.

MATH341 Multivariable Calculus, Linear Algebra, Differential Equations II (Honors) (4 Credits)
A continuation of MATH340.
Prerequisite: Minimum grade of C- in MATH340 and permission of CMNS-Mathematics department; and permission will be granted only to current freshmen.
Restriction: Open to second semester Freshmen only.
Credit Only Granted for: MATH240, MATH246, MATH341 or MATH461.

MATH386 Experiential Learning (3-6 Credits)
Prerequisite: Must have learning proposal approved by the CMNS Mathematics Department.

MATH401 Applications of Linear Algebra (3 Credits)
Various applications of linear algebra: theory of finite games, linear programming, matrix methods as applied to finite Markov chains, random walk, incidence matrices, graphs and directed graphs, networks and transportation problems.
Prerequisite: 1 course with a minimum grade of C- from (MATH461, MATH240, MATH341).

MATH402 Algebraic Structures (3 Credits)
For students having only limited experience with rigorous mathematical proofs. Parallels MATH403. Students planning graduate work in mathematics should take MATH403. Groups, rings, integral domains and fields, detailed study of several groups; properties of integers and polynomials. Emphasis is on the origin of the mathematical ideas studied and the logical structure of the subject.
Prerequisite: 1 course with a minimum grade of C- from (MATH240, MATH341, MATH461).
Restriction: Must not be in any of the following programs (Mathematics (Master's); Mathematics (Doctoral)).
Credit Only Granted for: MATH402 or MATH403.

MATH403 Introduction to Abstract Algebra (3 Credits)
Integers; groups, rings, integral domains, fields.
Prerequisite: 1 course with a minimum grade of C- from (MATH405 or MATH410).
Credit Only Granted for: MATH402 or MATH403.

MATH404 Field Theory (3 Credits)
Algebraic and transcendental elements, Galois theory, constructions with straight-edge and compass, solutions of equations of low degrees, insolubility of the quintic equation, Sylow theorems, fundamental theorem of finite Abelian groups.
Prerequisite: Minimum grade of C- in MATH403.

MATH405 Linear Algebra (3 Credits)
An abstract treatment of finite dimensional vector spaces. Linear transformations and their invariants.
Prerequisite: 1 course with a minimum grade of C- from (MATH240, MATH461, MATH341); and minimum grade of C- in MATH310.

MATH406 Introduction to Number Theory (3 Credits)
Integers, divisibility, prime numbers, unique factorization, congruences, quadratic reciprocity, Diophantine equations and arithmetic functions.
Prerequisite: 1 course with a minimum grade of C- from (MATH240, MATH241, MATH246, MATH340, MATH341, MATH461, MATH243, ENEE290); or permission of CMNS-Mathematics department.

MATH410 Advanced Calculus I (3 Credits)
Subjects covered: sequences and series of numbers, continuity and differentiability of real-valued functions of one variable, the Riemann integral, sequences of functions and power series.
Prerequisite: 1 course with a minimum grade of C- from (MATH240, MATH461, MATH341); and 1 course with a minimum grade of C- from (MATH340, MATH241); and minimum grade of C- in MATH310; and permission of CMNS-Mathematics department.

MATH411 Advanced Calculus II (3 Credits)
Continuation of MATH410. Topics include: The topology of sets in Rn, the derivative matrix, the general chain rule, inverse and implicit function theorems with applications, smooth curves and surfaces in R3, Lagrange multipliers. Additional topics may include: Metric spaces, the contraction principle, the existence and uniqueness theorem for nonlinear first order differential equations, the Riemann integral of Rn, introduction to integration on curves and surfaces, Green's theorem.
Prerequisite: Minimum grade of C- in MATH410.

MATH416 Applied Harmonic Analysis: An Introduction to Signal Processing (3 Credits)
Introduces students to the mathematical concepts arising in signal analysis from the applied harmonic analysis point of view. Topics include applied linear algebra, Fourier series, discrete Fourier transform, Fourier transform, Shannon Sampling Theorem, wavelet bases, multiresolution analysis, and discrete wavelet transform.
Prerequisite: Minimum grade of C- in MATH141; and 1 course with a minimum grade of C- from (MATH240, MATH461, MATH341); and familiarity with MATLAB is required.

MATH420 Mathematical Modeling (3 Credits)
The course will develop skills in data-driven mathematical modeling through individual and group projects. Emphasis will be placed on both analytical and computational methods, and on effective oral and written presentation of results.
Prerequisite: 1 course with a minimum grade of C- from (MATH240, MATH461, MATH341, ENEE290, MATH243); and 1 course with a minimum grade of C- from (MATH241, MATH340); and 1 course with a minimum grade of C- from (MATH246, MATH341, ENEE290, MATH243); and 1 course with a minimum grade of C- from (STAT400, STAT410); and 1 course with a minimum grade C- from (CMSC106, CMSC131).
Recommended: AMSC460 or AMSC466.
Cross-listed with: AMSC420.
Credit Only Granted for: AMSC420 or MATH420.

MATH423 Linear Optimization (3 Credits)
Mathematical formulation of linear programming, graphical solutions, simplex method, duality, transportation problems, assignment problems, and game theory.
Prerequisite: 1 course with a minimum grade of C- from (MATH240, MATH401, MATH461, or MATH341).
Credit Only Granted for: MATH423 or MATH498T.
Formerly: MATH498T.

MATH424 Introduction to the Mathematics of Finance (3 Credits)
Introduction to the mathematical models used in finance and economics with emphasis on pricing derivative instruments. Designed for students in mathematics, computer science, engineering, finance and physics. Financial markets and instruments; elements from basic probability theory; interest rates and present value analysis; normal distribution of stock returns; option pricing; arbitrage pricing theory; the multiperiod binomial model; the Black-Scholes option pricing formula; proof of the Black-Scholes option pricing formula and applications; trading and hedging of options; Delta hedging; utility functions and portfolio theory; elementary stochastic calculus; Ito's Lemma; the Black-Scholes equation and its conversion to the heat equation.
Prerequisite: Minimum grade of C- in MATH141; and 1 course with a minimum grade of C- from (STAT400, STAT410); and permission of CMNS-Mathematics department.
Recommended: MATH246, MATH240, MATH241, MATH340, or MATH341.
Credit Only Granted for: BMGT444, MATH424.

MATH430 Euclidean and Non-Euclidean Geometries (3 Credits)
Hilbert's axioms for Euclidean geometry. Neutral geometry: the consistency of the hyperbolic parallel postulate and the inconsistency of the elliptic parallel postulate with neutral geometry. Models of hyperbolic geometry. Existence and properties of isometries.
Prerequisite: 1 course with a minimum grade of C- from (MATH240, MATH341, MATH461).

MATH431 Geometry for Computer Applications (3 Credits)
Topics from projective geometry and transformation geometry, emphasizing the two-dimensional representation of three-dimensional objects and objects moving about in the plane and space. The emphasis will be on formulas and algorithms of immediate use in computer graphics.
Prerequisite: 1 course with a minimum grade of C- from (MATH461, MATH240, MATH341).

MATH432 Introduction to Topology (3 Credits)
Metric spaces, topological spaces, connectedness, compactness (including Heine-Borel and Bolzano-Weierstrass theorems), Cantor sets, continuous maps and homeomorphisms, fundamental group (homotopy, covering spaces, the fundamental theorem of algebra, Brouwer fixed point theorem), surfaces (e.g., Euler characteristic, the index of a vector field, hairy sphere theorem), elements of combinatorial topology (graphs and trees, planarity, coloring problems).
Prerequisite: Minimum grade of C- in MATH410.

MATH436 Differential Geometry of Curves and Surfaces I (3 Credits)
Curves in the plane and Euclidean space, moving frames, surfaces in Euclidean space, orientability of surfaces; Gaussian and mean curvatures; surfaces of revolution, ruled surfaces, minimal surfaces, special curves on surfaces, "Theorema Egregium"; the intrinsic geometry of surfaces.
Prerequisite: 1 course with a minimum grade of C- from (MATH241, MATH340); and 1 course with a minimum grade of C- from (MATH461, MATH240, MATH341); and must have completed two 400-level MATH courses with a minimum grade of C- (not including MATH461, and 480's).

MATH437 Differential Forms (3 Credits)
Introduction to differential forms and their applications, and unites the fundamental theorems of multivariable calculus in a general Stokes Theorem that is valid in great generality. It develops this theory and technique to perform calculations in analysis and geometry. Topics include an introduction to topological spaces, the Gauss-Bonnet Theorem, Gauss's formula for the linking number, and the Cauchy Integral Theorem. Applications include Maxwell's equations of electromagnetism, connections and gauge theory, and symplectic geometry and Hamiltonian dynamics.
Prerequisite: 1 course with a minimum grade of C- from (MATH241, MATH340); and 1 course with a minimum grade of C- from (MATH240, MATH341, MATH461).
Recommended: MATH405, MATH403, MATH436, MATH410, or MATH432.

MATH440 Geometry and Data Science of Sports Analytics (3 Credits)
Students will learn as well as gain hands-on experience in geometrical aspects and data analysis aspects of sports performance analytics. The course will involve programming via Python as well as other software. Topics may include JSON, using API to gather and analyze big data sets arising in sports analytics, detecting geometrical patterns in data, analyzing motion tracking data. Interactions between mathematics, statistics, hands-on programming and geometry of data sets will be emphasized.
Prerequisite: MATH240, MATH341 or MATH461.
Recommended: Python programming experience.
Credit Only Granted for: MATH498R or MATH440.
Formerly: MATH498R.

MATH445 Elementary Mathematical Logic (3 Credits)
Elementary development of propositional and predicate logic, including semantics and deductive systems and with a discussion of completeness, incompleteness and the decision problem.
Prerequisite: Minimum grade of C- in MATH141.

MATH446 Axiomatic Set Theory (3 Credits)
Development of a system of axiomatic set theory, choice principles, induction principles, ordinal arithmetic including discussion of cancellation laws, divisibility, canonical expansions, cardinal arithmetic including connections with the axiom of choice, Hartog's theorem, Konig's theorem, properties of regular, singular and inaccessible cardinals.
Prerequisite: 1 course with a minimum grade of C- from (MATH403, MATH410).

MATH452 Introduction to Dynamics and Chaos (3 Credits)
An introduction to mathematical dynamics and chaos. Orbits, bifurcations, Cantor sets and horseshoes, symbolic dynamics, fractal dimension, notions of stability, flows and chaos. Includes motivation and historical perspectives, as well as examples of fundamental maps studied in dynamics and applications of dynamics.
Prerequisite: MATH341; or MATH246 and one of (MATH240 or MATH461).
Cross-listed with: AMSC452.
Credit Only Granted for: AMSC452 or MATH452.

MATH456 Cryptography (3 Credits)
The theory, application, and implementation of mathematical techniques used to secure modern communications. Topics include symmetric and public-key encryption, message integrity, hash functions, block-cipher design and analysis, number theory, and digital signatures.
Prerequisite: (CMSC106, CMSC131, or ENEE150; or equivalent programming experience); and (2 courses from (CMSC330, CMSC351, ENEE324, or ENEE382); or any one of these courses and a 400-level MATH course, or two 400-level MATH courses); and Permission of CMNS-Mathematics department or permission of instructor.
Cross-listed with: CMSC456, ENEE456.
Credit Only Granted for: MATH456, CMSC456 or ENEE456.

MATH461 Linear Algebra for Scientists and Engineers (3 Credits)
Basic concepts of linear algebra. This course is similar to MATH240, but with more extensive coverage of the topics needed in applied linear algebra: change of basis, complex eigenvalues, diagonalization, the Jordan canonical form.
Prerequisite: Minimum grade of C- in MATH141.
Credit Only Granted for: MATH240, MATH341, or MATH461.
Additional Information: This course may not be used towards the upper level math requirements for MATH/STAT majors.

MATH462 Partial Differential Equations (3 Credits)
Linear spaces and operators, orthogonality, Sturm-Liouville problems and eigenfunction expansions for ordinary differential equations. Introduction to partial differential equations, including the heat equation, wave equation and Laplace's equation. Boundary value problems, initial value problems and initial-boundary value problems.
Prerequisite: 1 course with a minimum grade of C- from (MATH241, MATH340); and 1 course with a minimum grade of C- from (MATH246, MATH341, ENEE290, MATH243).

MATH463 Complex Variables (3 Credits)
The algebra of complex numbers, analytic functions, mapping properties of the elementary functions. Cauchy integral formula. Theory of residues and application to evaluation of integrals. Conformal mapping.
Prerequisite: 1 course with a minimum grade of C- from (MATH241, MATH340).

MATH464 Transform Methods (3 Credits)
Fourier transform, Fourier series, discrete fast Fourier transform (DFT and FFT). Laplace transform. Poisson summations, and sampling. Optional Topics: Distributions and operational calculus, PDEs, Wavelet transform, Radon transform and applications such as Imaging, Speech Processing, PDEs of Mathematical Physics, Communications, Inverse Problems.
Prerequisite: 1 course with a minimum grade of C- from (MATH246, MATH341, ENEE290, MATH243).

MATH470 Mathematics for Secondary Education (3 Credits)
An advanced perspective on some of the core mathematics underlying high school mathematics courses. Topics include number systems, functions of one variable, equations, inequalities, trigonometric functions, curve fitting, and polynomials. The course includes an analysis of alternate approaches to mathematical ideas and problems, and makes connections between ideas that may have been studied separately in different high school and college courses.
Prerequisite: MATH141 and MATH140; and must have completed one 400-level MATH course (not to include MATH461, 478, and 480's).
Restriction: Must be in the Secondary Math Education major.

MATH475 Combinatorics and Graph Theory (3 Credits)
General enumeration methods, difference equations, generating functions. Elements of graph theory, matrix representations of graphs, applications of graph theory to transport networks, matching theory and graphical algorithms.
Prerequisite: 1 course with a minimum grade of C- from (MATH240, MATH341, MATH461, ENEE290, MATH243); and 1 course with a minimum grade of C- from (MATH241, MATH340); and 1 course with a minimum grade of C- from (MATH310, CMSC250).
Cross-listed with: CMSC475.
Credit Only Granted for: MATH475 or CMSC475.

MATH478 Selected Topics For Teachers of Mathematics (1-3 Credits)
Prerequisite: Permission of CMNS-Mathematics department.
Additional Information: Math majors may not use this course to fulfill the upper-level math requirement.

MATH480 Algebra for Middle School Teachers (3 Credits)
Prepares teachers with elementary certification to teach Algebra 1 in middle school. Focuses on basic algebra concepts and related theoretical ideas.
Prerequisite: MATH214.
Restriction: Must be a middle school teacher; and permission of CMNS-Mathematics department.
Credit Only Granted for: MATH480 or MATH483.
Additional Information: Not applicable to MATH/STAT major or minor requirements.

MATH481 Statistics and Data Analysis for Middle School Teachers (3 Credits)
Prepares teachers with elementary certification to teach simple data analysis and probability in middle school. Focuses on understanding basic statistics, data analysis, and related theoretical ideas.
Prerequisite: MATH214.
Restriction: Must be a middle school teacher; and permission of CMNS-Mathematics department.
Credit Only Granted for: MATH481 or MATH485.
Additional Information: Not applicable to MATH/STAT major or minor requirements.

MATH484 Geometry for High School Teachers (3 Credits)
Focuses on concepts related to geometry, including several geometry axiom schemes, transformations, and similarity. Includes constructions with Geometer's Sketchpad.
Prerequisite: MATH141; or students who have taken courses with comparable content may contact the department.
Restriction: Senior standing.
Credit Only Granted for: MATH482, MATH484, or MATH498E.
Formerly: MATH498E.

MATH487 Number for Middle Grades Teachers (3 Credits)
The rational number and proportional reasoning concepts developed in the middle grades and the larger mathematical context for these. Multiple representations of relationships, including verbal descriptions, diagrams, tables, graphs, and equations. Common misconceptions.
Prerequisite: Must have admission to M.A. or M.Ed. with concentration in Mathematics Education; or permission of CMNS-Mathematics department.
Restriction: This course may not be used towards the upper level math requirements for the MATH/STAT major.
Credit Only Granted for: MATH487 or MATH498K.
Formerly: MATH498K.

MATH489 Research Interactions in Mathematics (1-3 Credits)
Students participate in a vertically integrated (undergraduate, graduate and/or postdoctoral, faculty) mathematics research group. Format varies. Students and supervising faculty will agree to a contract which must be approved by the department. Up to three credits of MATH489 may be applied to the mathematics degree requirements. See the department's MATH489 online syllabus for further information.
Prerequisite: Permission of CMNS-Mathematics department.
Repeatable to: 10 credits if content differs.

MATH498 Selected Topics in Mathematics (1-9 Credits)
Topics of special interest to advanced undergraduate students will be offered occasionally under the general guidance of the departmental committee on undergraduate studies.
Repeatable to: 9 credits if content differs.

MEES - Marine-Estuarine-Environmental Sciences

MEES412 Applied Bayesian Statistics (2 Credits)
This seminar will explore the practices of Bayesian network and graphical model to high dimensional inter-disciplinary environmental data. Through hands-on experience and real studies from Bayesian perspectives, students will learn the basics of evaluating Bayesian network and graphical analyses, and interpreting and communicating the results. Case studies involving ecological and environmental science will be used to illustrate Bayesian analyses. The statistical programming language R and software packages such as OpenBUGS, JAGS, and STAN will be used in illustrating Bayesian models.
Jointly offered with: MEES612.
Credit Only Granted for: MEES608R, MEES612, or MEES412.

MEES432 Physiological Ecology of Animals (3 Credits)
An examination of the influence of environmental constrains on animal function and energetic efficiency in the context of abiotic conditions in the habitats occupied by individuals.
Prerequisite: BSCI361; or students who have taken courses with comparable content may contact the department; or permission of instructor.
Credit Only Granted for: MEES498E, MEES698E, MEES432, or MEES632.
Formerly: MEES498E.

MEES484 Marine Microbial Ecology (3 Credits)
The primary goal of this course is to become familiar with the diversity, ecology, and biogeochemical roles of Bacteria, Archaea, microbial Eukaryotes, viruses, and fungi in the marine environment. The course will also cover the latest discoveries in molecular microbial ecology. Each main topic will begin with a lecture and will be followed by a paper discussion. For the paper discussions, each student will present selected papers specified in the syllabus (or by consensus with the course instructors). Students will also participate in class discussions.
Jointly offered with: MEES684.
Credit Only Granted for: MEES484 or MEES684.

MEES498 Topics in Marine-Estuarine-Environmental Sciences (1-4 Credits)
Lecture and/or laboratory series organized to study a selected area of marine-estuarine-environmental sciences not otherwise considered in formal courses.

MIEH - Maryland Institute for Applied Environmental Health

MIEH300 A Public Health Perspective: Introduction to Environmental Health (3 Credits)
Environmental health is that branch of public health that deals with the human health effects of exposure to chemical, physical, and biological agents in the community, workplace, and home. Activities within Environmental Health Sciences are associated with recognizing, assessing, understanding, and mitigating the impacts of chemical, physical, and biological agents as well as understanding how human behavior and action impacts the environment. This course focuses on the central concepts, principles, issues, and applications of the essential scientific components and strategies of control of major environmental health problems.
Prerequisite: Minimum grade of C- in CHEM131 and CHEM132; and must have completed or be concurrently enrolled in SPHL100 or PHSC300.
Restriction: Must have earned a minimum of 60 credits; and must be in Public Health Science program; or permission of SPHL-School of Public Health.
Credit Only Granted for: SPHL498N or MIEH300.
Formerly: SPHL498N.

MIEH309 Environmental Health Research (1-3 Credits)
This research-based course will provide undergraduates with the opportunity to work closely with one of the faculty researchers in the Maryland Institute for Applied Environmental Health (MIAEH) within the School of Public Health. Our research covers multiple fields within the environmental health sciences (e.g. environmental epidemiology, exposure science, risk assessment, environmental microbiology, environmental microbial genomics, food toxicology, airborne infection transmission, environmental justice, and children's environmental health) that involve either laboratory-based research or non-laboratory based studies. Students will not only gain invaluable research and interpersonal skills but also contribute to MIAEH's ongoing environmental health research programs.
Restriction: Must have completed a minimum of 45 credits; and must have permission of instructor.
Repeatable to: 9 credits if content differs.

MIEH321 Environmental Determinants of Emerging Infectious Diseases (3 Credits)
Examines the influences of environmental factors, economic development, migration, and land use changes on emergence and reemergence of infectious diseases. Explores how population growth, development, and climate change impact natural reservoirs of infectious diseases and how they are transmitted through human populations. Includes historical accounts, newly emerging and reemerging diseases.
Prerequisite: Must have completed or be concurrently enrolled in SPHL100.

MIEH325 Introduction to Clinical Research Methods (3 Credits)
Introduces you to the importance of clinical research, including how studies are developed, structured, and implemented. You will also get hands-on experience with a variety of clinical sample collection methods. We will broadly review topics important to clinical research, including an overview of bioethics in research, the basics of clinical study structure and design, data collection, and the importance of good record keeping. You will apply this knowledge by developing your own clinical research project and creating a proposal in the structure of a grant funding application. You will also learn about topics related to clinical sample collection, including basic anatomy, the tools and procedures used, and the appropriate application of these procedures, as well as learning how to collect some basic clinical samples such as nasal swabs and blood samples.

MIEH330 Environmental Justice, Racism, and Environmental Health Disparities: How where you live can kill you (3 Credits)
Examination of environmental justice history, theory and science; discussion of linkages between the physical, natural, and social environments and environmental injustice; analysis of how environmental injustice can lead to adverse health conditions and environmental health disparities; discuss environmental justice case studies; and understanding of tools that can be used to understand and address environmental justice issues.
Prerequisite: Minimum grade of C- in MIEH300.
Restriction: Must be in a major in SPHL-School of Public Health.
Credit Only Granted for: MIEH210 or MIEH330.
Formerly: MIEH210.

MIEH331 The Built Environment, Sustainability, and Public Health: The Good, the Bad, and the Ugly (3 Credits)
Provides students with a fundamental understanding of theory, concepts, and issues related to the built environment; how the built environment influences behaviors and health outcomes; and opportunities to improve the built environment through planning, zoning, and community development initiatives that can make communities healthier, just, and more sustainable.
Prerequisite: Minimum grade of C- in MIEH300; or permission of instructor.
Credit Only Granted for: MIEH215 or MIEH331.
Formerly: MIEH215.

MIEH333 Every Drop Counts: Water, Food and Global Public Health (3 Credits)
In-depth interdisciplinary study of the public health issues related to water use for global food production. Topics will include accessibility and availability of safe water for agriculture worldwide, potential microbiological and chemical hazards in agricultural water, alternative water sources such as reclaimed wastewater and return flows, food safety approaches to managing agricultural water, and agricultural influences on surface and groundwater quality. Political, social, and economic factors relating to agricultural water will be addressed, with special focus on regions that are leaders in innovative water management and regions where access to clean water for agriculture is a major challenge.
Prerequisite: ENSP101 or MIEH300; or permission of department.
Cross-listed with: ENSP360.
Credit Only Granted for: MIEH333 or ENSP360.

MIEH407 One Health: Food Safety and Security (3 Credits)
This is a collaborative course with the University of Maryland and Cairo University, Cairo, Egypt to explore the One Health Foundation and its application to improving international food safety and security. The purpose of this global undergraduate class is to disseminate knowledge on One Health and its application to improving global food safety and security. Students will apply principles of One Health to ensure food safety and food security in Egypt.
Jointly offered with: MIEH607.
Restriction: Must have earned at least 75 credits .
Credit Only Granted for: MIEH607 or MIEH407.

MIEH480 Introduction to Occupational Health (3 Credits)
Through in-person site visits, hands-on activities and case studies, students will learn about healthy workplaces and their critical role in public health. The course will center on the field of occupational health and safety. Site visits will enable students to hear firsthand from workers, local health & safety professionals, and former students now in the field. Case studies will allow students to explore today's critical work hazards across various work environments and industries.Students will develop and apply essential skills, such as conducting a safety walk-through in a worksite, leading a worker safety training, and writing a safety plan for an employer. Upon course completion, students will be prepared to address traditional workplace problems, as well as emerging hazards like extreme heat, poor indoor air quality, and the mental health challenges of today's workplace.
Prerequisite: Minimum grade of C- in MIEH300 and EPIB301.
Recommended: BSCI201.

MITH - Maryland Institute for Technology in the Humanities

MITH301 Digital Publishing with Minimal Computing: Humanities at a Global Scale (3 Credits)
In this Global Classrooms course, students of the University of Maryland and Universidad del Salvador, Buenos Aires, will come together to learn how to create and assess websites from a critical and humanities-focused perspective. Specifically, the course will introduce "minimal computing" approaches, which privilege the use of open technologies, ownership of data and code, reduction in computing infrastructure and, consequently, environmental impact. The course is structured around a group project with students from both universities. You will collaborate virtually to create a multilingual (Spanish and English) digital edition of a colonial era text, while learning about Digital Humanities approaches to literary studies, digital publishing, history, and postcolonial studies.
Credit Only Granted for: MITH301, ENGL378M, CMLT398M, or LACS348C.
Additional Information: Knowledge of the Spanish language is not required as teaching and collaboration will be conducted in English. In the spirit of fostering a multilingual approach, however, we will not discourage the use of Spanish among students and instructors; mutual respect and cooperation are paramount to the success of your course project.

MITH388 Digital Humanities Research Assistantship (1-3 Credits)
An applied introduction to the theory and practice of digital research. The internship includes regular meetings with MITH staff, including designers, developers, information professionals, project managers, and faculty, to gain knowledge of existing digital scholarship and resources within the arts and humanities. Students may contribute to existing MITH projects or propose a small, independent research project on which they will receive support from MITH staff.
Restriction: Permission of instructor.
Repeatable to: 6 credits.

MITH498 Special Topics in Applied Digital Humanities (3 Credits)
An introduction to special topics, and technical approaches, for theoretically grounded humanities and social sciences digital research. Class meetings will introduce students to a variety of technical approaches potentially applicable to the specific topical foci; the theoretical basis for selecting, evaluating, and modifying technical approaches; and best practices in project management.
Repeatable to: 9 credits if content differs.

MLAW - MPower Undergraduate Law Programs

MLAW100 Justice and the Law (3 Credits)
An exploration into the relationship between justice and law, including psychological, philosophical, political and legal approaches to justice, as well as an analytical framework for understanding human rights.
Restriction: Course enrollment is restricted to first-semester students in the College Park Scholars Justice and Legal Thought Program (CPJT).

MLAW150 Law in a Just Society (3 Credits)
An exploration of the theoretical questions relating to such fundamental questions of jurisprudence as "what is law?" and "how can law be deployed as both an enemy and ally of justice?
Prerequisite: MLAW100.
Restriction: Course enrollment is restricted to students in the College Park Scholars Justice and Legal Thought Program.

MLAW217 Mock Trial (3 Credits)
Experience the excitement and reward of arguing, and perhaps winning your client's case in court. Mock Trial is designed for students who are interested in learning practical techniques for shaping the evidence, using the law, and exploiting the courtroom to create a coherent and convincing case theory.
Cross-listed with: GVPT217.
Credit Only Granted for: MLAW217, GVPT217, or GVPT319A.
Formerly: GVPT319A.

MLAW298 Special Topics in Legal Studies (1-3 Credits)
Substantive and experiential approaches to legal phenomena. Topics vary.
Repeatable to: 6 credits if content differs.

MLAW304 Introduction to Law and Social Inquiry (3 Credits)
An exploration of the relationship between law and society from an interdisciplinary perspective. Major themes cover the impact of law on society, society on law and social change.
Restriction: Must be in the Law and Society (MLAW) minor.

MLAW305 Law and Legal Institutions in Social Context (3 Credits)
An exploration of case law, statutes, and regulations separately and together in their social context.
Prerequisite: MLAW304.
Restriction: Must be a student in the Law and Society Minor.

MLAW315 Citizenship and Naturalization in America (2 Credits)
Notions of who is an American - and who is not - are deeply rooted in the American ethos. Although the United States has long been praised for its inclusiveness vis-a-vis citizenship - including a policy of jus soli, or birthright citizenship - a closer look reveals a difficult history involving the categorical exclusion of many groups from American citizenship. We will examine this history, focusing particularly on Black and Native Americans and immigrants, and drawing upon legal cases, historical texts, and personal narratives detailing the lived experiences of those seeking American citizenship. We will trace this history to the present and explore the current process and requirements for becoming an American citizen. Students will have an opportunity to engage guests and discussions from the Maryland Carey School of Law and other experts.
Restriction: Must be in the Law and Society minor (MLAW); or must be in College Park Scholars Justice and Legal Thought (CPJT).

MLAW325 Naturalization Workshop Practicum (1 Credit)
The focus of this Practicum is a naturalization workshop whereby students will assist eligible Marylanders in applying for citizenship. Students will work with faculty and law students to design, plan, and implement a naturalization workshop, to take place on a Saturday in the spring semester. Students will work directly with law students and faculty.
Prerequisite: MLAW315 or by permission of the department.

MLAW358 Selected Topics in Law and Society (3 Credits)
An interdisciplinary exploration of topics in law and society. Major scholarly interpretations of specific substantive fields of law.
Restriction: Must be in the Law and Society Minor.
Repeatable to: 6 credits if content differs.

MLAW359 Undergraduate Teaching Assistant Experience (3 Credits)
Designed to engage experienced Law and Society students as mentors and class leaders. Students will be involved in lesson planning, course design, field trips, and class discussion as they develop their leadership and public speaking skills.
Prerequisite: MLAW304.
Restriction: Must be enrolled in the Law and Society minor; and permission of program.
Repeatable to: 6 credits.
Formerly: MLAW355.

MLAW378 Special topics in Law and Society (3 Credits)
An interdisciplinary examination in law and society, relying on scholarly interpretations of specific substantive topics of law
Recommended: MLAW304.
Restriction: Must be in Law and Society Minor.
Repeatable to: 6 credits if content differs.

MLAW388 Law and Society Internship (1-4 Credits)
Participation in the Law and Society Internship (LASI) offers students the opportunity to enhance their education through practical skill building in the realm of law-related professionals.
Repeatable to: 7 credits.

MLAW404 Law & Society Capstone (3 Credits)
An exploration of the implications of technology on law and society from a variety of perspectives.Significant issues will be taken from contemporary scholarship and court cases.
Restriction: Student must be enrolled in the Law and Society minor.

MLAW411 Appellate Advocacy I (3 Credits)
By the end of this class, and with proper supervision, students should be able to competently brief and argue an appeal before any appellate court in the country. The skills taught in this class also transfer to other contexts that demand clear legal analysis, efficient and comprehensive legal research, excellent writing and effective oral advocacy. For students interested in pre-law skills, whether they plan to go to law school or some career that requires analytical reasoning, persuasive writing, and advocacy skills.
Recommended: MLAW304.

MLSC - MD Language Science Ctr

MLSC220 Science Communication and Language Science at the Museum (3 Credits)
Learning to communicate complicated scientific ideas in a simple, engaging way is central not only to success in scientific arenas, but also to professional and civic life more broadly. This course gives hands-on experience in science communication, focusing specifically on communicating about language science, or the study of how language is learned, used, and represented in the mind. Because of this focus, students will have the opportunity to develop their science communication skills interacting with visitors at Planet Word museum in Washington DC, a museum about words and language. In addition to practical skills, especially oral presentation skills, the course provides grounding in the scholarship, principles, and frameworks of science communication. Regardless of students' future career paths or majors, the knowledge and skills gained in this course are highly transferable across domains and fields.
Additional Information: This course requires travel and off campus learning hours at the Planet Word Museum, located at 925 13th Street NW, Washington, DC 20005.

MLSC250 Lol that's not funny: Language change and linguistic creativity in online communication (3 Credits)
Recent developments in technology, from texting to Zoom, have created new environments for human language use. Examining how communication is changing in these environments highlights humans' endless linguistic ingenuity -- ranging from new vocabulary and punctuation conventions to the use of hashtags, emoji and memes. At the same time, these linguistic innovations exemplify broader patterns of language change and diversity that have been documented and studied by language scientists. In this course, we will engage with the study of language variation and change through a survey of language use in different online environments, and will apply insights from linguistic research to analyze our own and others' language use in more nuanced ways.

MLSC308 PULSAR Language Science Research Seminar (1 Credit)
Research seminar for students in the PULSAR language science program. Weekly presentations and discussions on diverse topics in language science research, as well as on developing research skills.
Restriction: Must be in PULSAR program or have permission of the instructor.
Repeatable to: 4 credits.
Credit Only Granted for: BSOS338P or MLSC308.
Formerly: BSOS388P.

MUED - Music Education

MUED155 Fundamentals for the Classroom Teacher (3 Credits)
The fundamentals of music theory and practice, related to the needs of the classroom and the kindergarten teacher.
Restriction: Must be in one of the following programs (Early Childhood Education; Elementary Education) ; or must be a Pre-Elementary Education major; or must be a Pre-Early Childhood Education major.

MUED186 Pre-professional Experiences I (2 Credits)
An orientation into the role of the music teacher in the school and community. On-site school visits at elementary, middle and high school levels form the basis for discussion and exploration of all facets of the music education profession.
Restriction: Must be in Music Education program.
Additional Information: Fulfills the College of Arts and Humanities requirement for ARHU158.

MUED187 Pre-Professional Experiences II (1 Credit)
Regular on-site school visitation at elementary, middle and high school levels arranged to expand student understandings and reflections of music instruction in classroom settings.
Prerequisite: MUED186.
Restriction: Must be in Music Education program.

MUED213 String Technique and Pedagogy I (2 Credits)
A study of violin, viola, cello and bass technique and pedagogy; beginning level. Emphasizes group process playing and teaching.
Restriction: Must be in Music Education program.

MUED215 Woodwind Technique and Pedagogy (2 Credits)
Playing experience on instruments of the woodwind family. Historical and acoustical background. Basic concepts of teaching. Methods and materials. Techniques of individual and class instruction.
Restriction: Permission of ARHU-School of Music department.

MUED216 Percussion Technique and Pedagogy (2 Credits)
Playing experience on percussion instruments. Historical and acoustical background. Scoring for percussion. Principles of improvisation. Basic concepts of teaching. Methods and materials. Techniques of individual and class instruction.
Restriction: Must be in Music Education program.

MUED217 Brass Instrument Technique and Pedagogy (2 Credits)
Playing experience on instruments of the brass family. Historical and acoustical background. Principles of improvisation. Basic concepts of teaching. Methods and materials. Techniques of individual and class instruction.
Restriction: Must be in Music Education program.

MUED269 Special Topics in Study Abroad II (1-6 Credits)
Special topics course taken as part of an approved study abroad program.
Repeatable to: 15 credits if content differs.

MUED305 Marching Band Techniques (2 Credits)
Designed to aid the student in learning how to prepare, organize, teach, and rehearse the contemporary high school marching band. Through class discussions, practical assignments, guest lecturers and audio/visual aids, students will gain a command of the terminology, pedagogy, and structure of a marching ensemble and its potential.
Restriction: Must be in Music Education program.
Credit Only Granted for: MUED499M or MUED305.
Formerly: MUED499M.

MUED311 Teaching Elementary Instrumental Music I (2 Credits)
Prepare instrumental-emphasis music education majors to synthesize the knowledge and skills that will enable them to teach fundamental musical skills at the elementary level.
Prerequisite: MUED187.
Restriction: Must be in Music Education program.

MUED320 Teaching Secondary Instrumental Music I (2 Credits)
Prepare instrumental-emphasis music education majors to synthesize the knowledge and skills that will enable them to extend secondary-level musical skill through planned instruction and development of teaching materials.
Prerequisite: MUED187.
Restriction: Must be in Music Education program.

MUED322 Teaching General Music I (2 Credits)
Teaching General Music I is designed as a fundamental music methods course for students who are preparing for a career in general music. This course will focus on developmentally appropriate teaching practices for building musicianship in a general music setting.
Prerequisite: MUED187 and MUED186.
Restriction: Must be in Music Education program.
Credit Only Granted for: MUED222 or MUED322.
Formerly: MUED222.

MUED333 Classroom Vocal Pedagogy (2 Credits)
An introduction to the fundamentals of group vocal pedagogy for the choral and general classroom teacher, including the teaching of posture, breathing, resonance, registration, articulation and foreign language diction as appropriate to needs of the child or adolescent singer in K-12 classroom settings.
Prerequisite: MUED187 and MUED186.
Restriction: Must be in Music Education program.

MUED342 Technology for Music Education (2 Credits)
Technology has profoundly remade nearly every facet of music, musicianship, and audience experience, including the education of music students. From the impact of recording, to the informational revolution of the internet, to the global economy, technology has accelerated the rate of change in our society and will likely continue to play a central role in the evolution of humanity. This course explores the broad dimensions of technology as they impact the lives of teachers and students in music education.
Restriction: Must be in Music Education program.
Credit Only Granted for: MUED342 or MUED499T.
Formerly: MUED499T.

MUED369 Special Topics in Study Abroad III (1-6 Credits)
Special topics course taken as part of an approved study abroad program.
Repeatable to: 15 credits if content differs.

MUED386 Experiential Learning (3-6 Credits)
Prerequisite: Must have learning proposal approved by the Office of Experiential Learning Programs, faculty sponsor, and student's internship sponsor.
Restriction: Junior standing or higher.

MUED411 Teaching Elementary Instrumental Music II (4 Credits)
Prepare instrumental-emphasis music education majors to synthesize the knowledge and skills that will enable them to develop and/or maintain an exemplary curricular-oriented, research-based, comprehensive elementary instrumental music program.
Prerequisite: MUED320 and MUED311.
Restriction: Must be in Music Education program.

MUED420 Teaching Secondary Instrumental Music II (4 Credits)
Prepare instrumental-emphasis music education majors to synthesize the knowledge and skills that will enable them to develop and/or maintain an exemplary, curricular-oriented, research-based, comprehensive secondary instrumental program.
Prerequisite: MUED320 and MUED311.
Restriction: Must be in Music Education program.

MUED422 Teaching General Music II (4 Credits)
Designed as an advanced music methods course and field experience for students who are preparing for a career in general music. The field experience is a practicum that is co-supervised by the university instructor and a general music educator.
Prerequisite: MUED322 and MUED333.
Restriction: Must be in Music Education program.
Credit Only Granted for: MUED422 or MUED471.
Formerly: MUED471.

MUED433 Teaching Choral Music (4 Credits)
Preparation for teaching choral classes through the integration of conducting technique, vocal pedagogy, knowledge of repertoire, and the application of appropriate instructional strategies in the context of peer teaching and field experience assignments.
Prerequisite: MUED422.
Restriction: Must be in Music Education program.
Credit Only Granted for: MUED472 or MUED433.
Formerly: MUED472.

MUED473 Teaching General Music for Instrumentalists (2 Credits)
Introduction to current trends, materials and approaches in general music instruction.
Prerequisite: MUED311; and MUED320.
Restriction: Must be in Music Education program.

MUED474 Field Experiences: Pre-Student Teaching (2 Credits)
Field experiences to fulfill teaching requirements in K-12 music teacher education program.
Prerequisite: MUED420 and MUED411; or (MUED433 and MUED422).
Restriction: Permission of ARHU-School of Music department; and senior standing.

MUED484 Student Teaching in Elementary School: Music (6 Credits)
Fulfills elementary teaching requirements in K-12 music teacher education program. Limited to music education majors who have previously applied.
Corequisite: MUED494.
Restriction: Permission of ARHU-School of Music department; and must be in Music Education program.

MUED489 Field Experiences (1 Credit)
Series of field experiences in K-12 settings.
Restriction: Permission of ARHU-School of Music department; and must be in Music Education program.
Repeatable to: 6 credits.

MUED494 Student Teaching in Secondary School: Music (6 Credits)
Fulfill secondary teaching requirements in K-12 music teacher education program. Limited to music education majors who have previously applied.
Corequisite: MUED484.
Restriction: Permission of ARHU-School of Music department; and must be in Music Education program.

MUED499 Workshops, Clinics, Institutes (1-3 Credits)
Innovative and experimental dimensions of music education offered to meet the needs of music teachers and music supervisors allowing students to individualize their programs.
Repeatable to: 6 credits if content differs.

MUET - Ethnomusicology

MUET269 Special Topics in Study Abroad II (1-6 Credits)
Special topics course taken as part of an approved study abroad program.
Repeatable to: 15 credits if content differs.

MUET369 Special Topics in Study Abroad III (1-6 Credits)
Special topics course taken as part of an approved study abroad program.
Repeatable to: 15 credits if content differs.

MUSC - School of Music

MUSC102 Class Piano (2 Credits)
Functional piano training for beginners. Development of techniques for school and community playing. Basic piano techniques; chord, arpeggio and scale techniques; melody and song playing; simple accompaniments, improvisation for accompaniments and rhythms; sight reading and transposition and playing by ear.

MUSC103 Beginning Class Piano II (2 Credits)
Functional piano training for beginners. Development of techniques useful for school and community playing. Basic piano techniques; chord, arpeggio, and scale techniques; melody and song playing; simple accompaniments, improvisation for accompaniments and rhythms; sight reading and transposition, and playing by ear. MUSC103 is a continuation of MUSC102; elementary repertoire is begun.
Prerequisite: MUSC102; or permission of ARHU-School of Music department.

MUSC106 Beginning Classical Guitar (2 Credits)
Introduction to classical guitar notation, technique, literature and performance. No previous musical experience required.

MUSC123 Movement for Singers (1 Credit)
Systematic exercises, improvisations and dances in conjunction with artistic vocal expression. Performance and critique of stage deportment, gestures and recital techniques.
Prerequisite: Permission of ARHU-School of Music department.

MUSC126 Vocal Diction: English (1 Credit)
An introduction to the fundamentals of phonetics and sound production as applied to singing English vocal literature through detailed work with IPA, the International Phonetic Alphabet.
Prerequisite: Permission of ARHU-School of Music department.

MUSC127 Vocal Diction: Italian (1 Credit)
Augmentation of private voice study. Phonetics and diction for singers of Italian vocal literature.
Prerequisite: Permission of ARHU-School of Music department.
Restriction: Must be in a major within the ARHU-School of Music department.

MUSC128 Sight Reading For Pianists (2 Credits)
A course to give the piano major an opportunity to develop proficiency in sight reading at the keyboard.
Repeatable to: 4 credits.

MUSC129 Ensemble (1 Credit)
Rehearsal and performance of selected works for small ensembles of instruments, piano, or small vocal groups. After two registrations in MUSC129, the student will elect MUSC229 for two additional semesters and MUSC329 thereafter.

MUSC130 What Does Music Mean? (3 Credits)
An examination of how music creates meaning in different eras, through studying musical sound, biography, and social history.
Restriction: Must not be in any of the following programs (Music (Professional Program); Music Education).

MUSC140 Music Fundamentals I (3 Credits)
Introductory theory course. Notation, scales, intervals, triads, rhythm, form and basic aural skills.
Restriction: Must not be in any of the following programs (Music (Professional Program); Music Education).

MUSC150 Theory of Music I (3 Credits)
A study of basic concepts and skills in tonal melody and harmony through analysis and composition.
Prerequisite: Departmental audition and entrance examination.
Restriction: Must be in one of the following programs (Music (Liberal Arts Program); Music (Jazz Performance Option); Music (Winds & Percussions Performance Option); Music (Voice Performance Option); Music Composition; Music (Professional Program); Music (Piano Performance Option); Music Performance-Winds and Percussion; Music Theory and Composition; Music Performance-Piano; Music Performance-Jazz Studies; Music Performance-Voice; Music Performance-Strings; Music (Strings Performance Option)).

MUSC151 Theory of Music II (3 Credits)
A continuation of MUSC150, including study of more advanced harmonic techniques of the eighteenth century, such as modulation and chromatic harmonies. Emphasis on sight singing, ear training, analysis and compositional skills.
Prerequisite: Minimum grade of C- in MUSC150.

MUSC202 Intermediate Class Piano I (2 Credits)
Advanced keyboard techniques. Continuation of skills introduced in MUSC103. Transposition, modulation and sight reading; methods of teaching functional piano.
Prerequisite: MUSC103; or must have equivalent piano training.

MUSC203 Intermediate Class Piano II (2 Credits)
Advanced keyboard techniques. Continuation of skills introduced in MUSC202. Transposition, modulation and sight reading; methods of teaching functional piano. Development of style in playing accompaniments and in playing for community singing. More advanced repertory.
Prerequisite: MUSC202; or must have equivalent piano training.

MUSC204 Popular Music in Black America (3 Credits)
Traces black popular music in the U.S. with a special focus on spirituals, ragtime, the blues, early jazz, RB, Motown, funk, soul, and rap. Examines how these styles have been borrowed by the American music industry.

MUSC205 History of Popular Music, 1950-Present (3 Credits)
A historical survey of rock music (blues, rock, soul, metal, rap, etc.) from circa 1950 to the present, with emphasis on popular music as music and popular music as social history.

MUSC210 The Impact of Music on Life (3 Credits)
Music as a part of culture. Materials drawn from traditions throughout the globe to illustrate issues of historical and contemporary significance, including the impact of race, class and gender on the study of music.
Credit Only Granted for: MUET210 or MUSC210.
Formerly: MUET210.

MUSC215 World Popular Musics and Identity (3 Credits)
Explore some of the most popular music genres in the world in order to learn about the roles that socially-constructed identities play in the promotion, presentation and interpretation of different types of popular music. Through historical context and performance analysis, this course invites students to consider how identities such as race, gender, sexuality, class, culture, religion, region and nation shape the development of genres and the functions they serve beyond mere entertainment.

MUSC220 Selected Musical Cultures of the World (3 Credits)
A critical and comparative exploration of musical practices from around the world in their social, political and economic contexts.
Restriction: Must not be in any of the following programs: (Music (Professional Program); Music Education).

MUSC226 Vocal Diction: French (1 Credit)
Augmentation of private voice study. Phonetics and diction for singers of French vocal literature.
Prerequisite: Permission of ARHU-School of Music department.
Restriction: Must be in a major within ARHU-School of Music department.

MUSC227 Vocal Diction: German (1 Credit)
Augmentation of private study. Phonetics and diction for singers of German vocal literature.
Prerequisite: Permission of ARHU-School of Music department.
Restriction: Must be in a major within ARHU-School of Music department.

MUSC228 Introduction to Accompanying for Pianists (2 Credits)
A course to introduce the piano major to accompanying at an intermediate level of difficulty. Class instruction will center on rehearsal and coaching geared toward performance, and will be supplemented by experience working as an accompanist in voice classes or applied studios.
Prerequisite: Permission of ARHU-School of Music department.
Restriction: Must be in a major within ARHU-School of Music department.
Repeatable to: 10 credits.

MUSC229 Ensemble (1 Credit)
Rehearsal and performance of selected works for small ensembles of instruments, piano, or small vocal groups. After two registrations in MUSC129, the student will elect MUSC229 for two additional semesters and MUSC329 thereafter.

MUSC240 Elements of Music Composition for Non-Majors (3 Credits)
Emphasizes learning concepts and techniques of music composition through the study of music theory and structure used in both classical and popular music forms. Students will compose music using computer assisted and composition tools. These tools include cloud based digital audio workstations and music notation programs. Compositions will be written in these musical styles but not limited to classical, jazz, and popular. Students will also explore methods of sharing their compositions on various digital platforms.
Prerequisite: MUSC 140, or by permission of instructor.
Recommended: Ability to read music on a grand staff (treble and bass clef).
Restriction: Must not be in any of the following programs: (Music (Professional Program); Music Education).
Credit Only Granted for: MUSC240 or HONR218M.
Formerly: HONR218M.

MUSC248 Selected Topics in Music (1-3 Credits)
Designed to allow a student of theory or music history to pursue a specialized topic or project under the supervision of a faculty member.
Prerequisite: Permission of ARHU-School of Music department.
Repeatable to: 6 credits if content differs.

MUSC250 Advanced Theory of Music I (4 Credits)
A continuation of MUSC 151, with further study of chromatic and modulatory techniques of the nineteenth century. Emphasis on sight singing, ear training, analysis and compositional skills.
Prerequisite: Minimum grade of C- in MUSC151.

MUSC251 Advanced Theory of Music II (4 Credits)
A continuation of MUSC250, concentrating on late nineteenth-century chromatic harmony and an introduction to twentieth-century melody and harmony. Emphasis on sight singing, ear training, analysis and compositional skills.
Prerequisite: Minimum grade of C- in MUSC250.

MUSC260 Music as Global Culture (3 Credits)
Explores how and why people create, transform, and move music around the globe. Taking a comparative approach to Western art musics and other musics of the world, course will examine a variety of musical practices in their social, political, and economic contexts. Experiential knowledge will be developed through hands-on ethnographic research.
Prerequisite: MUSC151.
Restriction: Must be in a major within the ARHU-School of Music department.
Credit Only Granted for: MUSC220 or MUSC260.

MUSC269 Special Topics in Study Abroad II (1-6 Credits)
Special topics course taken as part of an approved study abroad program.
Repeatable to: 15 credits if content differs.

MUSC289I Exploring the Power of Musical Performance in Social Engagement (3 Credits)
Explores the ways people, across cultures and times, have drawn on music's power to further causes such as revolution and social change or to bring attention to injustices such as discrimination, exclusion, or oppressive working conditions.

MUSC328 Introduction to Chamber Music for Pianists (2 Credits)
A course to introduce the piano major to chamber music at a moderately difficult level. Class instruction will center on actual rehearsal and coaching geared toward performance, and will be supplemented by further experience in applied instrumental studios.
Prerequisite: Permission of ARHU-School of Music department.
Repeatable to: 10 credits.

MUSC329 Ensemble (1 Credit)
Rehearsal and performance of selected works for small ensembles of instruments, piano, or small vocal groups. After two registrations in MUSC129, the student will elect MUSC229 for two additional semesters and MUSC329 thereafter.

MUSC339 Honors in Music (3 Credits)
The production of one or more recitals or lecture-recitals; one or more compositions; or one or more honors theses in addition to regular degree requirements. Two semesters required.
Prerequisite: Permission of ARHU-School of Music department.
Corequisite: MUSC349.
Repeatable to: 6 credits.

MUSC349 Honors Seminar in Music (1 Credit)
Group discussion of projects undertaken in MUSC339. Two semesters required.
Corequisite: MUSC339.
Repeatable to: 2 credits.

MUSC360 Music in Western Culture Before 1900 (3 Credits)
Course will be looking at roughly 800 years of Western art music in Europe and America (ca.1100-1900) through the lens of selected "moments"--intersections of historical space and time, observing music as an art form practiced in a public eye, both as a social event and a cultural practice.
Prerequisite: MUSC260.
Restriction: Must be in a major within the ARHU-School of Music department.
Credit Only Granted for: MUSC310 or MUSC360.

MUSC361 Music in Western Culture After 1900 (3 Credits)
Continuation of MUSC360. A historical study of Western classical music, popular music, and jazz since 1900.
Prerequisite: MUSC360.
Restriction: Must be in a major within the ARHU-School of Music department.
Credit Only Granted for: MUSC330 or MUSC361.

MUSC369 Special Topics in Study Abroad III (1-6 Credits)
Special topics course taken as part of an approved study abroad program.
Repeatable to: 15 credits if content differs.

MUSC379 Opera Workshop (1 Credit)
Open to music and non-music majors (by audition). Operatic production and performance, performance techniques and coaching, stage direction, set design, costume design and make-up. Repertory will include smaller operatic works, excerpts or scenes.
Restriction: Must complete a departmental audition.
Repeatable to: 4 credits.

MUSC386 Experiential Learning (3-6 Credits)
Prerequisite: Permission of ARHU-School of Music department.
Restriction: Junior standing or higher.

MUSC388 Music Internship (3 Credits)
Pre-professional field work in music.
Prerequisite: Permission of ARHU-School of Music department.
Corequisite: MUSC389.
Repeatable to: 6 credits.

MUSC389 Music Internship Analysis (1 Credit)
Documentation and evaluation of field work experience.
Corequisite: MUSC388.
Repeatable to: 2 credits.

MUSC400 Music Pedagogy (3 Credits)
Conference course. A study of major pedagogical treatises in music, and an evaluation of pedagogical techniques, materials, and procedures.
Prerequisite: MUSP315; and permission of ARHU-School of Music department.

MUSC420 Introduction to Ethnomusicology (3 Credits)
Study of principal concepts and methods in ethnomusicology, covering history of field, linguistics and anthropology, music in various settings, musical cognition and ethnography of performance.
Prerequisite: MUSC210 and MUSC130; or permission of ARHU-School of Music department.
Restriction: Junior standing or higher.

MUSC428 Repertoire Coaching of Vocal or Chamber Music (2 Credits)
A course for piano students who wish to go further than the work offered in MUSC128, MUSC228 and MUSC328 by becoming specialists in the areas of vocal coaching or chamber music coaching. Elements of pedagogy, conducting and responsible artistic decision-making for the entire musical production.
Prerequisite: Must have completed or be concurrently enrolled in MUSC328.

MUSC434 Creating Historic Woodwinds (3 Credits)
Students will learn the art of woodworking and blend techniques of modern and historic instrument-making methods. Using wood lathes, metalworking tools, 3d scanners and selective laser sintering 3d printers. Student teams will first train to acquire the skills needed to use fabrication equipment. Each mixed team will then share their individual discipline's skills to help contribute to the creation of a completed musical instrument. Along the way, we'll explore the historical and cultural context of instrument making and the musical period.
Cross-listed with: ENES434.
Restriction: Permission of the School of Music.
Credit Only Granted for: ENES434 or MUSC434.

MUSC436 Jazz: Then and Now (3 Credits)
Major styles and influential artists of the past 75 years of jazz.

MUSC438 Area Studies in Ethnomusicology (3 Credits)
Advanced study of musics in selected parts of the world.
Repeatable to: 9 credits if content differs.

MUSC439 Collegium Musicum (1 Credit)
Open to undergraduates and graduates, music majors and non-majors. Procurement, edition and performance of music not belonging to a standard repertory: early music, compositions for unusual performing media, works which demand reconstruction of their original circumstances of performance. Outcome of a semester's work may be one or more performances for the public.
Prerequisite: Permission of ARHU-School of Music department.
Repeatable to: 5 credits.

MUSC442 Creating Historic Woodwinds (3 Credits)
In this class, students will learn the art of woodworking and blend techniques of modern and historic instrument-making methods. Using wood lathes, metalworking tools, 3d scanners and selective laser sintering 3d printers. Student teams will first train to acquire the skills needed to use fabrication equipment. Each mixed team will then share their individual discipline's skills to help contribute to the creation of a completed musical instrument. Along the way, we'll explore the historical and cultural context of instrument making and the musical period.
Cross-listed with: ENES442.
Credit Only Granted for: MUSC442 or ENES442.

MUSC443 Solo Vocal Literature (3 Credits)
The study of solo vocal literature from the Baroque Cantata to the Art Song of the present. The Lied, Melodie, vocal chamber music and the orchestral song are examined.
Prerequisite: MUSC330 and MUSC331; or students who have taken courses with comparable content may contact the department.

MUSC444 Wind and Percussion Literature (1 Credit)
Recital program notes and written projects in wind or percussion literature.
Prerequisite: Permission of ARHU-School of Music department.
Corequisite: MUSP420 or MUSP419.

MUSC445 Survey of the Opera (3 Credits)
A study of the music, librettos and composers of the standard operas.
Prerequisite: MUSC330 and MUSC331; or students who have taken courses with comparable content may contact the department.

MUSC446 String Literature (1 Credit)
Recital program notes and written projects in string literature.
Prerequisite: MUSP316; and permission of ARHU-School of Music department.

MUSC448 Selected Topics in Music (1-3 Credits)
Prerequisite: Permission of ARHU-School of Music department.
Repeatable to: 6 credits if content differs.

MUSC448E Arts Entrepreneurship and the Creative Profession (3 Credits)
Introduces students to arts entrepreneurship in preparation for diverse and ever-changing careers in the creative fields. Students will practice and develop their entrepreneurial mindsets and learn about different frameworks for audience engagement. Topics include financial management, revenue development, business planning, and the "need-to-knows" of the gig economy. Throughout the semester, students will have the opportunity to learn from a variety of entrepreneurs in the arts and to evaluate their future career paths.
Recommended: ARHU240.
Cross-listed with: ARHU340.
Credit Only Granted for: ARHU340 or MUSC448E.

MUSC450 Musical Form (3 Credits)
A study of the principles of organization in music with emphasis on eighteenth and nineteenth century European music. Reading and analysis of scores exemplifying the musical forms.
Prerequisite: MUSC251.

MUSC451 Analysis of Music (3 Credits)
A course in the analysis of music. Discussion of individual works, with emphasis on their unique characteristics and on the relation of analysis to performance.
Prerequisite: MUSC450; or permission of instructor.

MUSC453 Jazz Improvisation I (3 Credits)
Jazz theory, notational conventions, improvisation techniques, reading and analysis of music, and performance in small combo format.
Prerequisite: MUSC251; or students who have taken courses with comparable content may contact the department. And permission of ARHU-School of Music department.
Credit Only Granted for: MUSC345 or MUSC453.
Formerly: MUSC345.

MUSC454 Jazz Improvisation II (3 Credits)
Continuation of MUSC453 including scoring and transcription.
Prerequisite: MUSC453; or students who have taken courses with comparable content may contact the department. And permission of ARHU-School of Music department.
Credit Only Granted for: MUSC346 or MUSC454.
Formerly: MUSC346.

MUSC455 Theory of Jazz (3 Credits)
Analysis of jazz harmony, with emphasis on principles of substitution, reharmonization, and syntax. Topics may also include chord/scale relationships, phrasing and articulation, notation, and introductory arranging concepts such as orchestration and form.
Prerequisite: MUSC250; or permission of ARHU-School of Music department.
Restriction: Must be in a major within ARHU-School of Music department.

MUSC456 Jazz Arranging (3 Credits)
A comprehensive approach to jazz arranging. Topics to include chord scale theory, voicing techniques, part and score layout, and formal construction of an arrangement.
Prerequisite: MUSC455; and permission of ARHU-School of Music department.
Credit Only Granted for: MUSC448N or MUSC456.
Formerly: MUSC448N.

MUSC460 Tonal Counterpoint I (3 Credits)
A course in Eighteenth-Century contrapuntal techniques, analysis and original composition of two-voice dances, preludes, and inventions. Includes an introduction to the study of fugue and canon.
Prerequisite: MUSC251; or permission of ARHU-School of Music department.

MUSC461 Theory and Analysis of Atonal and Twelve-tone Music (3 Credits)
An advanced technical introduction to theory and analysis of atonal and twelve-tone music, with an emphasis on music by Schoenberg, Webern, Bartok, and Stravinsky.
Prerequisite: MUSC251 and MUSC450; and permission of ARHU-School of Music department.
Restriction: Must be in Music Theory and Composition program. Jointly offered with MUSC661.
Credit Only Granted for: MUSC46 1 or MUSC661.

MUSC463 Technology and a Career in Music (3 Credits)
A hands-on introduction to technology as it applies to music creation and recording. Digital audio workstations, music notation software, and cloud-based music technology are used to create and manipulate musical examples with an eye toward their practical applications for professional musicians.
Recommended: Ability to read music on a grand staff (treble and bass clef).
Additional Information: No previous experience with technology is required.

MUSC464 The Theories of Heinrich Schenker (3 Credits)
An advanced analysis course in tonal music with specific emphasis on the theories of the early 20th century theorist Heinrich Schenker. Specific analyses of music by Bach, Mozart, Haydn, Beethoven, Chopin, and Brahms.
Prerequisite: MUSC251 and MUSC450; and permission of ARHU-School of Music department.
Restriction: Must not have completed MUSC651.
Credit Only Granted for: MUSC464 or MUSC651.

MUSC467 Piano Pedagogy I (3 Credits)
A study of major pedagogical treatises in music, and an evaluation of pedagogical techniques, materials, and procedures.
Prerequisite: Permission of ARHU-School of Music department.

MUSC468 Piano Pedagogy II (3 Credits)
Application of the studies begun in MUSC467 to the actual lesson situation. Evaluation of results.
Prerequisite: MUSC467; and permission of ARHU-School of Music department.
Repeatable to: 6 credits.

MUSC469 Orchestral Excerpts for String Players (1 Credit)
In-depth study of the orchestral excerpts required for professional orchestra auditions.
Restriction: Permission of ARHU-School of Music department.
Repeatable to: 6 credits if content differs.
Credit Only Granted for: MUSC469, MUSC448B, MUSC448Q, MUSC448V, or MUSC448X.
Formerly: MUSC448B, MUSC448Q, MUSC448V, and MUSC448X.

MUSC470 Harmonic and Contrapuntal Practices of the Twentieth Century (3 Credits)
A theoretical and analytical study of twentieth century materials.
Prerequisite: MUSC251; or students who have taken courses with comparable content may contact the department. And permission of ARHU-School of Music department.

MUSC471 Contemporary Compositional Techniques (3 Credits)
Continuation of MUSC470, with emphasis on the analysis of individual works written since 1945.
Prerequisite: MUSC470; or permission of ARHU-School of Music department.

MUSC472 Music Composition for Music Majors (3 Credits)
A course for music majors who wish to develop skills and creative abilities in music composition. Student writing projects will be discussed in class and models of compositional techniques will be studied in literature from diverse styles and style periods.
Prerequisite: MUSC450 or equivalent; and permission of instructor.
Restriction: Registration restricted to music majors who are not majoring in music composition (cannot be in Major code: 1004B).
Credit Only Granted for: MUSC448O or MUSC472.
Formerly: MUSC448O.

MUSC481 Music in the Renaissance (3 Credits)
Survey of western music from 1450 to 1600.

MUSC482 Music in the Baroque Era (3 Credits)
Survey of western music from 1600 to 1750.

MUSC484 Music in the Romantic Era (3 Credits)
Survey of western music from 1820 to 1900.

MUSC486 Orchestration I (3 Credits)
A study of the ranges, musical functions and technical characteristics of the instruments and their color possibilities in various combinations. Practical experience in orchestrating for small and large ensembles.
Prerequisite: MUSC251; and permission of ARHU-School of Music department.

MUSC490 Conducting (2 Credits)
Vocal and instrumental baton techniques.
Prerequisite: MUSC251.

MUSC491 Conducting II (2 Credits)
Baton techniques applied to score reading, rehearsal techniques, tone production, style and interpretation.
Prerequisite: MUSC490; or students who have taken courses with comparable content may contact the department.

MUSC492 Keyboard Music I (3 Credits)
The history and literature of harpsichord and solo piano music from its beginning to the romantic period. Emphasis is placed on those segments of repertory which are encountered in performance and teaching situations at the present time.
Prerequisite: Permission of ARHU-School of Music department.

MUSC493 Keyboard Music II (3 Credits)
The history and literature of harpsichord and solo piano music from the Romantic period to the present. Emphasis is placed on those segments of repertory which are encountered in performance and teaching situations at the present time.
Prerequisite: MUSC492; and permission of ARHU-School of Music department.

MUSC499 Independent Studies (1-3 Credits)
Independent research on a topic chosen in consultation with the instructor, which may culminate in a paper or appropriate project.
Prerequisite: Permission of ARHU-School of Music department.
Repeatable to: 18 credits.

MUSP - Music Performance

NOTE ABOUT MUSP COURSES

Undergraduate Music Performance Courses are available in three series:

1. ***Minor Series**: 2-credits each course. Prerequisite: permission of department chairperson. Limited to music majors studying a secondary instrument and to non-music majors. Each course in the series must be taken in sequence. The initial election for all new students, both freshman and transfer, is MUSP 102. Transfer students are evaluated for higher placement after one semester of study. One-half hour private lesson per week plus assigned independent practice. MUSP 102, MUSP 103 Freshman Courses. MUSP 202, 203 Sophomore Courses. MUSP 302, 303 Junior Courses. MUSP 402, 403 Senior Courses.*
2. ***Principal Series**: 2-4 credits each course. Prerequisites: departmental audition, entrance examination, and permission of department chairperson. Limited to majors in music programs other than performance and composition. Each course in the series must be taken in sequence. The initial election for all new students, both freshman and transfer, is 109. Transfer students are evaluated for higher placement after one semester of study. One-hour private lesson per week plus assigned independent practice. Courses 109, 208, and 409 may be repeated once for credit, but only one successful attempt in each course may be applied towards baccalaureate degree requirements. MUSP 109, 110, Freshman Courses. MUSP 207, 208 Sophomore Courses. MUSP 305, 306 Junior Courses. MUSP 409, 410 Senior Courses. Recital required in MUSP 410.*
3. ***Major Series**: 2-4 credits each course. Prerequisites: departmental audition, entrance examination, and permission of department chairperson. Limited to majors in performance and composition. Each course in the series must be taken in sequence. The initial election for all new students, both freshman and transfer, is 119. Transfer students are evaluated for higher placement after one semester of study. One-hour private lesson per week plus assigned independent practice. Courses 119, 218, and 419 may be repeated once for credit, but only one successful attempt in each course may be applied towards baccalaureate degree requirements. MUSP 119, 120 Freshman Courses. MUSP 217, 218 Sophomore Courses. MUSP 315, 316 Junior Courses. MUSP 419, 420 Senior Courses. Recital required in MUSP 420.*

***Instrument designation**: Each student taking a music performance course must indicate the instrument chosen by adding a suffix to the proper course number, such as: MUSP 102A music performance: A--piano; B--voice; C--violin; D--viola; E--cello; F--bass; G--flute; H--oboe; I--clarinet; J--bassoon; K--saxophone; L--horn; M--trumpet; N-- trombone; O--tuba; P--euphonium; Q--percussion; T--composition; U--world instruments; V--harp; W--electronic composition; X--hist inst - keyboard; Y--hist inst - strings; Z--hist inst - winds.*

MUSP102 Music Performance (2 Credits)

MUSP269 Special Topics in Study Abroad II (1-6 Credits)
Special topics course taken as part of an approved study abroad program.
Repeatable to: 15 credits if content differs.

MUSP302 Music Performance (2 Credits)

MUSP303 Music Performance (2 Credits)

MUSP369 Special Topics in Study Abroad III (1-6 Credits)
Special topics course taken as part of an approved study abroad program.
Repeatable to: 15 credits if content differs.

MUSP386 Experiential Learning (3-6 Credits)
Prerequisite: Must have Learning Proposal approved by the Office of Experiential Learning Programs, faculty sponsor, and student's internship sponsor.
Restriction: Junior standing or higher.

MUSP402 Music Performance (2 Credits)
Senior course, in the minor series.

MUSP403 Music Performance (2 Credits)
Senior course, in the minor series.

MUSP409 Music Performance (2-4 Credits)
Senior course in the principal series.

MUSP410 Music Performance (2-4 Credits)
Senior course in the principal series. Recital required.

MUSP419 Music Performance (2-4 Credits)
Senior course in the major series.

MUSP420 Senior Recital (4 Credits)
Senior course in the major series. Recital required.

NAVY - Navy

NAVY100 Introduction to Naval Science (3 Credits)
Introduction to the naval profession and concepts of sea power. Major topics explored are the mission, strategy, organization, and descriptions of the U.S. Navy and Marine Corps. Students will gain a basic understanding of warfighting capabilities, required leadership skills, training and education, and the duties and responsibilities of a U.S. Navy and Marine Corps Junior Officer. The student will learn Naval courtesy and customs, military justice, and nomenclature as well as the professional competencies required to become a naval officer.

NAVY101 Sea Power and Maritime Affairs (3 Credits)
Introduces the student to the key themes of naval and maritime history. Curriculum presents an analysis through lectures, reading, and student discussion of the relationship of sea power to American history. Classical concepts and contemporary employment of sea power are examined by viewing historic and current naval and maritime developments.

NAVY108 Naval Science Leadership Lab (1 Credit)
Introduces the student to a variety of instructional sessions and/or activities that will develop the leadership component of the Naval ROTC program. The Naval Science leadership lab may include, but not be limited to, close-order drill, physical fitness training, ceremonial functions, Department of the Navy policy, guest lecturers, general military training (GMT), Anti-Terrorism Force Protection (ATFP), traffic safety, nutrition, stress management, prevention of sexual harassment, and operations security.Corequisite: 1 course from NAVY100-402 course range.
Corequisite: 1 course from NAVY100-402 course range.
Restriction: Permission of UGST-Navy ROTC.
Repeatable to: 8 credits.

NAVY200 Leadership and Management (3 Credits)
Introductory course designed to familiarize students with the theories, processes, and behaviors that enable effective leadership and managerial competence. Students will engage in analytical discussions, review leadership development and education, and Navy/Marine Corps-based case study discussions in order to develop their understanding of personal strengths, values and growth opportunities in the context of team, group and organizational leadership.
Restriction: Permission of UGST-Navy ROTC.
Additional Information: Priority enrollment will be given to students enrolled in the NROTC program.

NAVY201 Navigation (3 Credits)
Introduces the student to a broad yet thorough education in basic surface ship navigation. Curriculum presents an overview of tools of the modern naval watch officer, and topics include celestial navigation, rules of the nautical road, piloting, practical chartwork, tides, instruments, publications, records, and electronic navigation systems. Instructional sessions and/or activities develop the maritime proficiency core competency of the Naval Reserve Officer Training Corps (NROTC) program.
Restriction: Permission of UGST-Navy ROTC.
Additional Information: Priority enrollment will be given to students enrolled in the University of Maryland NROTC program.

NAVY300 Naval Ship Systems I (Engineering) (3 Credits)
Introduces the student to a comprehensive fundamental understanding of United States naval engineering principles and systems. Topics include thermodynamics, incompressible fluid flow, electrical theory, hydraulics and pneumatics, power train components, fluid/lube oil systems, desalination, fundamentals of nuclear power, propulsion systems (internal combustion, gas turbines, and steam), electrical distribution, ship stability and control and damage control. Students will also examine case studies to apply and analyze course topics within naval ships systems contexts.
Recommended: MATH140 and MATH141.
Restriction: Permission of UGST-Navy ROTC.
Additional Information: Priority enrollment will be given to students enrolled in the NROTC program.

NAVY301 Naval Ship Systems II (Weapons) (3 Credits)
Introduces the student to a comprehensive fundamental understanding of United States naval weaponry. Includes theory and employment of weapons systems, including the processes of detection, evaluation, threat analysis, weapon selection, delivery, guidance, and explosives. Radar and sonar systems and major weapon types, including capabilities and limitations. Facets of command, control, and communications as means of weapons system integration. Curriculum presents an in-depth review of surface, sub-surface, aviation, and Marine Corps weapons and platforms.
Recommended: MATH140, MATH141, and PHYS161.
Restriction: Permission of UGST-Navy ROTC.
Additional Information: Priority enrollment will be given to students enrolled in the NROTC program.

NAVY302 Evolution of Warfare (3 Credits)
Traces the development of warfare, from earliest recorded history to the present, with focus on the impact of major military theorists, strategists, tacticians, and technological developments. The student acquires an intermediate sense of strategy and develops an understanding of military alternatives and the impact of historical precedent on military thought and actions.
Recommended: NAVY100 and NAVY101.
Restriction: Permission of UGST-Navy ROTC.
Additional Information: Priority enrollment will be given to students in the NROTC program.

NAVY400 Naval Operations and Seamanship (3 Credits)
Capstone course for senior NROTC Navy-option midshipmen in advanced navigation, communications, naval operations, and naval warfare. Students learn through simulation in a computer classroom known as the Maritime Skills Simulator (MSS), in addition to lectures, discussions, and qualitative and quantitative tests/examinations. Students will engage in discussions regarding the moral and ethical responsibilities or military leaders, as well as the essential attributes of character required for effective leadership.
Recommended: NAVY201.
Restriction: Permission of UGST-Navy ROTC.
Additional Information: Priority enrollment will be given to students enrolled in the NROTC program.

NAVY401 Leadership and Ethics (3 Credits)
Integrates an intellectual exploration of Western moral traditions and ethical philosophy with military leadership, core values, the Uniform Code of Military Justice, and Navy regulations. The course provides students with a basic understanding of major moral traditions including Relativism, Utilitarianism, Kantian Ethics, Natural Law Theory, Divine Command Theory, and Virtue Ethics.
Recommended: NAVY200.
Restriction: Permission of UGST-Navy ROTC.
Additional Information: Priority enrollment will be given to students enrolled in the NROTC program.

NAVY402 Fundamentals of Maneuver Warfare (3 Credits)
A detailed study of the characteristics of modern warfare and their interactions with maneuver warfare doctrine, with a focus on the United States Marine Corps. Throughout the course, there is a strong focus on leadership, as the fundamental purpose of this course is to develop the skills, knowledge, leadership background and mentality necessary for a successful future leadership and service, whether in the military or the civilian sector.
Recommended: NAVY100, NAVY101, NAVY200, and NAVY108.
Restriction: Permission of UGST-Navy ROTC.
Additional Information: Priority in enrollment will be given to students in the NROTC program.

NEUR - Neuroscience

NEUR200 Introduction to Neuroscience (3 Credits)
In an evolutionary sense, the job of the nervous system is to produce, control, and coordinate behaviors that help an animal survive and reproduce. Neuroscience is the study of how the nervous system does that. Provides a broad introduction to neuroscience, always keeping the behavioral consequences in view.
Prerequisite: Minimum grade of C- in BSCI170 and BSCI171.
Cross-listed with: PSYC202.
Credit Only Granted for: PSYC309U, NEUR200, PSYC202 or PSYC301.
Formerly: PSYC309U.

NEUR238 Special Topics in Neuroscience Student Initiated Courses (1 Credit)
Student Initiated Course (STIC) in Neuroscience. Course will be student initiated and taught in a "journal club" style under close supervision of a faculty mentor. Student instructor and faculty mentor must generate proposal and have approval of the Neuroscience Program to offer a NEUR238 STIC. NEUR238 cannot be applied to the degree requirements of any neuroscience major.
Repeatable to: 5 credits if content differs.

NEUR305 Neural Systems and Circuits (3 Credits)
Overview of the fundamental principles underlying the systems and circuits of the human nervous system, with a focus on cognitive processes and how these systems interact. Students will engage in the analysis of case studies, apply their knowledge of the neural circuitry to explain everyday phenomena, hypothesize ways to further investigate the nervous system, and propose how knowledge of neural circuits can be used in human society and the resulting implications.
Prerequisite: Minimum grade of C- in MATH120 or higher MATH course; and a minimum grade of C- in NEUR200 or BSCI353; or equivalent.

NEUR306 Cellular and Molecular Neuroscience (3 Credits)
Students will gain an appreciation of neuroscience as the nexus of chemistry, physics, and biology. Additionally, they will gain an understanding of how: both individual and networks of neurons function as variable electrical circuits; our nervous systems transduce signals from the outside world and sets-off molecular cascades; the behavior of a neuron can be changed and or remain the same in response to changing variables. Techniques used to study the nervous system at a cellular and molecular level will be discussed.
Prerequisite: 1 course with a minimum grade of C- from NEUR200, BSCI207 or BSCI330.
Corequisite: Must have completed or be concurrently enrolled in PHYS132 or equivalent course.
Cross-listed with: BSCI353.
Credit Only Granted for: NEUR306 or BSCI353.

NEUR329 Instructional Assistance Practicum (1-3 Credits)
Students serve as instructional assistants in selected undergraduate neuroscience courses. Roles and responsibilities and pre/co-requisites are determined on a course- specific basis and approved by the Program Curriculum Committee.
Repeatable to: 9 credits.
Additional Information: Course not acceptable toward major requirements in the Neuroscience.

NEUR379 Special Topics: Research in Neuroscience (1-3 Credits)
Research and/or integrated reading in a topic related to neuroscience, under the direction and close supervision of a member of the University of Maryland faculty.
Recommended: At least a 3.0 neuroscience track GPA and no records of academic misconduct.
Restriction: Permission of Neuroscience Program.
Repeatable to: 12 credits.

NEUR398 Neuroscience Honors Seminar (1 Credit)
This seminar provides an opportunity for the honors students to share their research projects and sharpen their communication skills through presentations, discussions, and peer-review thesis writing. Guest speakers will be invited to provide additional information and insights into various topics in professional development practice, graduate school info and application, etc.
Prerequisite: NEUR200.
Corequisite: NEUR379, NEUR479, or equivalent research credit with instructor permission.
Repeatable to: 4 credits.

NEUR405 Neuroscience Laboratory (3 Credits)
Students will utilize neurophysiological techniques to examine fundamental principles of neurons and neural circuits. This course will reinforce content from prerequisite NEUR courses. Students will also strengthen skills in experimental design and scientific writing.
Prerequisite: NEUR306 or BSCI353; and PHYS132.
Recommended: NEUR305.
Cross-listed with: BSCI455.
Credit Only Granted for: PSYC401, NEUR405, BSCI455 or BSCI454.

NEUR479 Advanced Research in Neuroscience (1-3 Credits)
Research and/or integrated reading in neuroscience under the direction and close supervision of a faculty member.
Prerequisite: Complete at least 3 credits of NEUR379 (or equivalent) with the same faculty member as NEUR479 credit.
Recommended: Minimum neuroscience track GPA of 3.0.
Restriction: Permission of the Neuroscience Program.
Repeatable to: 12 credits.

NFSC - Nutrition and Food Science

NFSC100 Elements of Nutrition (3 Credits)
Fundamentals of human nutrition. Nutrient requirements related to changing individual and family needs.
Credit Only Granted for: KNES264, KNES289F or NFSC100.

NFSC103 Nutrition and Sports Performance (3 Credits)
Nutrition and Sports Performance would give students a brief overview of positive health-related outcomes of a physically active lifestyle. Students would design a fitness regimen and be able to describe when and how glycogen, blood glucose, fat, and protein are used to meet energy needs during different types of physical activity. They would be able to differentiate between anaerobic and aerobic use of glucose, and identify advantages and disadvantages of each. This course would outline how to estimate and athlete's calorie need and discuss the general principles for meeting overall nutrient requirements in the training diet. The problems associated with rapid weight loss by dehydration and the importance of water and/or sports drinks during exercise would be examined. An understanding of the importance of staying well-nourished with carbohydrate, protein, and various vitamins and minerals before, during, and after training would be discussed.

NFSC112 Food: Science and Technology (3 Credits)
Introduction to the realm of food science, food technology and food processing. An overview of the largest industry in the U.S. with emphasis on the science of food and the technology of food preservation from harvest through processing and packaging to distribution and consumer utilization.

NFSC220 Diet: Is it a cause or a solution (3 Credits)
If diet is such a straightforward topic, then why and how does this simple matter result in complicated health problems? This course delves deeply into a Big Question at the intersection of diet and health. Diet is a topic that most people know but few people understand. In addition, diet has become one of the most important lenses for looking at a variety of social, economic, and cultural issues. Since the concept of diet is a continuum and has multifaceted aspects, we need to understand it from broad and multidisciplinary perspectives including social, cultural, and economic aspects.

NFSC298 Sports Nutrition Internship Practicum (1 Credit)
This internship allows students to gain hands on experience working in collegiate athletics. Students interact with an interdisciplinary team including registered dietitians, coaches, trainers, physicians and others to develop and enhance nutrition-related knowledge and skills. They also gain invaluable experience and exposure to the day-to-day duties of a collegiate sports dietitian. Students participate in a weekly 50-minute discussion that is held by two sports nutrition dietitians, and complete 9 hours per week hands on activities at Gossett Football Team House, Xfinity Center, and Varsity Team House.
Prerequisite: Must have completed or be concurrently enrolled in NFSC100; and permission of instructor; or students who have taken courses with comparable content may contact the department.
Repeatable to: 8 credits if content differs.

NFSC315 Nutrition During the Life Cycle (3 Credits)
A study of how development throughout life, including prenatal development, pregnancy, lactation, adolescence and aging, alter nutrient requirements. Students will apply this knowledge to the dietary needs and food choices of these different groups.
Prerequisite: Minimum grade of C- in NFSC100.

NFSC341 Fermented Food, Feed, and Pharmaceuticals (3 Credits)
Fermentation is a biochemical process that improves and preserves the organoleptic and nutritional values of various food and feed products. In addition, fermentation is a biotechnology tool which cultivates microorganisms or other raw materials into important pharmaceuticals and other industrial products. The objective of this course is to learn how fermented foods and feeds are produced and study the microbial starter cultures used in creating these probiotic-rich and functional foods. Fermentation techniques in animal feed production will be discussed in this course and the influence of these techniques on the nutritional requirements and digestive physiology of animals as well as the nutritive value of the feedstuffs will be studied. The process of production of pharmaceuticals such as antibiotics, enzymes and insulin and their applications will also be studied.
Prerequisite: AGST130; and CHEM271; or by permission of the instructor.
Jointly offered with: NFSC641.

NFSC350 Foodservice Operations (5 Credits)
Introduction to management. Responsibilities in quantity food production and purchasing in a foodservice operation. Laboratory experience in planning, preparation, and service of meals which meet the nutritional needs of the consumer.
Prerequisite: Minimum grade of C- in BSCI223 and BMGT364.
Restriction: Must be in Nutrition and Food Science: Dietetics program.

NFSC380 Methods of Nutritional Assessment (3 Credits)
Methods of assessing human nutritional status of populations and individuals. These methods include dietary, anthropometric, clinical evaluations and biochemical measurements.
Prerequisite: Minimum of C- in NFSC315 and BCHM461.
Restriction: Must be in Nutrition and Food Science: Food Science program.

NFSC386 Experiential Learning (3-6 Credits)
Prerequisite: Permission of AGNR-Nutrition and Food Science department.
Restriction: Junior standing or higher.
Formerly: FDSC386 and NUTR386.

NFSC388 Honors Thesis Research (3-6 Credits)
Undergraduate honors thesis research conducted under the direction of an AGNR faculty member in partial fulfillment of the requirements of the College of AGNR Honors Program. The thesis will be defended to a faculty committee.
Restriction: Must be admitted to AGNR Honors Program.
Repeatable to: 6 credits if content differs.

NFSC398 Seminar (1 Credit)
Presentation and discussion of current literature and research in food science.
Formerly: FDSC398.

NFSC399 Special Problems in Food Science (1-3 Credits)
Designed for advanced undergraduates. Specific problems in food science will be assigned.
Formerly: FDSC399.

NFSC412 Food Processing Technology (4 Credits)
Provides in-depth study of the major industrial modes of food preservation. It integrates aspects of the biology, microbiology, biochemistry and engineering disciplines as they relate to food processing technology and food science.
Prerequisite: CHEM241, CHEM242, NFSC431, NFSC414, and NFSC434.
Corequisite: NFSC421 and NFSC423.
Recommended: MATH120; or completion of MATH220 recommended.

NFSC414 Mechanics of Food Processing (4 Credits)
Applications in the processing and preservation of foods, of power transmission, hydraulics, electricity, thermodynamics, refrigeration, instruments and controls, materials handling and time and motion analysis.
Prerequisite: PHYS121.
Credit Only Granted for: ENBE414 or NFSC414.
Formerly: ENBE414.

NFSC416 Food Safety System (2 Credits)
Focuses on identifying and reducing biological, chemical and physical risks in food manufacturing and thereby reduce outbreak incidences and improve public health. The course is based on the US FDA recognized curriculum on 'Hazard Analysis and Risk Based Preventive Controls' (HARPC) regulations for manufacturing human foods. A successful completion of this course will result in students becoming 'preventive controls qualified individuals' as defined by the US FDA.
Restriction: Permission of AGNR-Nutrition and Food Science department.
Repeatable to: 0 credit.
Credit Only Granted for: NFSC498T, NFSC416, NFSC679T, or NFSC616.
Formerly: NFSC498T.

NFSC420 Nutritional Biochemistry (4 Credits)
This is a comprehensive course that integrates aspects of biochemistry, nutrition, and molecular biology. This course deals with (1) structure and function of biochemical macromolecules including carbohydrates, proteins, lipids, and nucleic acids; (2) transcriptional and translational regulation focusing on how gene expression is controlled at the level of transcription and translation, particularly in response to nutritional factors; (3) nutritional principles covering impact of digestion and absorption; (4) biochemical metabolism on emphasis of how the body processes nutrients and how metabolic pathways are regulated.
Prerequisite: NFSC315 and BCHM461.

NFSC421 Food Chemistry (3 Credits)
Basic chemical and physical concepts are applied to the composition and properties of foods. Emphasis on the relationship of processing technology to the keeping quality, nutritional value, and acceptability of foods.
Prerequisite: BCHM461.

NFSC422 Food Product Research and Development (3 Credits)
A capstone course for FDSC majors. A study of the research and development of new food products. Application of food technology, engineering, safety and packaging are integrated by teams of students to develop a new food product from concept to pilot plant scale-up. Students will travel to nearby food processing plants on two to four Saturdays during the semester.
Restriction: Senior standing; and must be in a major within AGNR-Nutrition and Food Science department; and permission of AGNR-Nutrition and Food Science department.
Formerly: FDSC422.

NFSC423 Food Chemistry Laboratory (3 Credits)
Analysis of the major and minor constituents of food using chemical, physical and instrumental methods in concordance with current food industry and regulatory practices. Laboratory exercises coincide with lecture subjects in NFSC421.
Prerequisite: Must have completed or be concurrently enrolled in NFSC421.

NFSC426 Current Topics in Nutrition and Chronic Disease (3 Credits)
Analysis of current topics related to diet, nutrition, and human health at cellular, molecular and biochemical level. Further, this course will provide overview of the current methods, and in vitro and in vivo model systems used in nutrition research. Syllabus includes topics relevant to dietary regulation of genes/proteins and their impact on both physiological and pathological conditions including hyperlipidemia, hyperglycemia, fibrosis, food allergy, nutraceuticals, inflammatory diseases (IBD), cardiovascular diseases (atherosclerosis and stenosis), and oncogenesis. This course is designed to help students to understand and apply current scientific concepts and research methods, and to obtain necessary skills in evaluation and interpretation of evidence based scientific data.
Jointly offered with: NFSC621.
Credit Only Granted for: NFSC498F, NFSC426, NFSC678F, or NFSC621.
Formerly: NFSC498F.

NFSC427 Current Topics on Diet, Gut Microbiota Health and Metabolic Disease (3 Credits)
A review of current science linking the gut microbiota/microbiome with general and public health. It covers the composition of a healthy gut microbiota, its acquisition, how it is studied and analyzed; Gut microbiota changes with diet, specific foods, immigration and globalization and exercise; Its links to obesity, liver disease, insulin resistance and diabetes and cardiovascular disease; Links to the immune system; Targeting the gut microbiota composition and function to protect against or treat metabolic diseases. This course will be of use to public health and health care professionals, Food and/or Nutrition scientists, Dieticians, and those generally interested in understanding the health relevance of news reports or scientific reports on the microbiome.
Recommended: BCHM461.
Jointly offered with: NFSC627.
Credit Only Granted for: NFSC678K, NFSC498K, NFSC427, or NFSC627.
Formerly: NFSC498K.

NFSC430 Food Microbiology (3 Credits)
A study of microorganisms of major importance to the food industry with emphasis on food-borne outbreaks, public health significance, bioprocessing of foods, disease control, and the microbial spoilage of foods.
Prerequisite: BSCI223; or permission of instructor.
Credit Only Granted for: ANSC430 or NFSC430.
Formerly: FDSC430.

NFSC431 Food Quality Control (4 Credits)
Definition and organization of the quality control function in the food industry; preparation of specifications; statistical methods for acceptance sampling; in-plant and processed product inspection. Instrumental and sensory methods for evaluating sensory quality, identity and wholesomeness and their integration into grades and standards of quality. Statistical Process Control (SPC).

NFSC434 Food Microbiology Laboratory (3 Credits)
A study of techniques and procedures used in the microbiological examination of foods.
Prerequisite: Must have completed or be concurrently enrolled in NFSC430.
Credit Only Granted for: NFSC434 or ANSC434.
Formerly: FDSC434.

NFSC436 Diet and Optimal Human Health (3 Credits)
Focuses on maintaining optimal health and preventing diseases in humans with attention to diet. Reviews the main causes (nutritional/ behavioral/lifestyle/ environmental/genetic factors) of diseases and nutrient needs, sources, functions and interactions, and deals with the benefits of healthy diets and nutraceutical/pharmaceutical option on human health. The emphasis will be on developing conceptual knowledge, critical thinking and problem solving skills and the application of nutrition in the health promotion.
Prerequisite: NFSC100, BSCI170, and BSCI171 .
Jointly offered with: NFSC636.
Credit Only Granted for: NFSC498L, NFSC678L, NFSC436, or NFSC636.
Formerly: NFSC498L.

NFSC440 Advanced Human Nutrition (4 Credits)
A critical study of physiologic, molecular and metabolic influences on utilization of carbohydrates, lipids, proteins, vitamins, macro-and micro-minerals, and nonnutritive components of food. Interactions of these nutrients and food components will be examined relative to maintaining health.
Prerequisite: Minimum of C- in NFSC100, BCHM462 and BSCI440.

NFSC450 Food and Nutrient Analysis (3 Credits)
Methods and practices of the analysis of foods and nutrients. An overview of the principles and basic mechanisms used in many of the analytical procedures commonly used in food and nutrition research. Emphasis will be placed on hands-on development of skills necessary to complete each analytical procedure; and on the accurate and concise description of the methodology and results from their application and on the regulations governing food analysis for nutritional labeling.
Prerequisite: BCHM461 and NFSC100.
Formerly: NUTR450.

NFSC455 Medical Nutrition Therapy I (4 Credits)
Advanced clinical nutrition course for dietetics or nutrition science majors. Modifications of the normal adequate diet to meet human nutritional needs in acute and chronic diseases and metabolic disorders. Includes energy balance and weight management, nutritional genomics, nutrition counseling, autoimmune disease, nutrition for pediatric conditions.
Prerequisite: NFSC380.
Corequisite: NFSC440.

NFSC456 Medical Nutrition Therapy II (4 Credits)
Modifications of the normal adequate diet to meet human nutritional needs in acute and chronic diseases and metabolic disorders.
Prerequisite: Minimum of C- in NFSC380 and NFSC440; and permission of AGNR-Nutrition and Food Science department.

NFSC470 Community Nutrition (3 Credits)
Perspectives underlying the practice of nutrition services in community settings. Assessment of needs, program planning and evaluation. Programs and strategies to meet nutrition needs outside the acute care setting, such as nutrition education and food assistance. National nutrition policy and federal initiatives in nutrition will be examined. Students will be required to travel to local community nutrition sites during the semester.
Prerequisite: Minimum of C- in NFSC315.

NFSC490 Special Problems in Nutrition (2-3 Credits)
Individually selected problems in the area of human nutrition.
Prerequisite: NFSC440; and permission of AGNR-Nutrition and Food Science department.

NFSC491 Professional Issues and Opportunities in Dietetics (3 Credits)
A capstone course for dietetics majors. Students will integrate knowledge and theory of nutrition, food, management, psychology, and social behaviors necessary to support quality dietetic practice. Working in teams, students will participate in case studies, simulated situations and community projects. Individuals and groups will present cases as well as papers on published research.
Prerequisite: Minimum of C- in NFSC350 and permission of Nutrition and Food Science Dietetics program.
Corequisite: NFSC456.
Restriction: Senior standing or higher; and must be in Nutrition and Food Science: Dietetics program.

NFSC498 Selected Topics (1-3 Credits)
Selected current aspects of food.
Restriction: Permission of AGNR-Nutrition and Food Science department.
Repeatable to: 6 credits if content differs.

OURS - Office of Undergraduate Research

OURS100 Entering Research (1 Credit)
Provides a structured, step-by-step approach to becoming involved in undergraduate research. This course equips students with essential skills for getting involved in research, from identifying research interests to communicating effectively with faculty members. The course also enables students to build transferable communication and professional skills. During the course, students will be immersed in an online community of peers seeking research opportunities.

OURS199 Research Internship (3 Credits)
Research and mentorship-centered course designed to provide research experience, technical skill sets, an understanding of the expectations and requirements of research environments, and broad professional development. Students in this course work directly with a faculty mentor and peers in laboratory and other research environments on the design and fulfillment of authentic and discipline-relevant research outcomes. The iterative advancement of final research products contributes to the development of higher capacities in collaboration and teamwork, communication, critical thinking, and discipline-specific training and skill sets.
Repeatable to: 12 credits.

OURS308 Peer Mentorship - Supporting Students Entering Research (1 Credit)
Enables experienced student researchers in all fields of study to examine and participate in the practice of peer mentoring. Course participants will serve as peer mentors to students in OURS100: Entering Research. The work of peer mentors in the course will be grounded in discussions and materials that prepare them for their mentoring engagements, and peer mentors will have ample opportunities to reflect on their experiences as mentors and the ways in which these experiences may inform their future work in research and other settings.
Restriction: Permission of the Office of Undergraduate Research.
Repeatable to: 6 credits.

OURS309 Peer Mentorship - Supporting Students in Course-Based Research (1-3 Credits)
Equips participants to serve as peer mentors to fellow undergraduates in research environments. Participants will explore concepts and theories from the Scholarship of Teaching and Learning (SoTL) while serving as peer mentors within course-based research or other experiential learning settings. Students will have rich opportunities to examine how this body of scholarship can inform their work as peer mentors, as well as to reflect on the ways in which their experiences as peer mentors might relate to arguments in the literature.
Restriction: Permission of the Office of Undergraduate Research.
Repeatable to: 6 credits.

PEER - Health Center

PEER311 Peer Education Mental Health & Wellness (3 Credits)
Designed to train students to become Peer Educators who are responsible for presenting to members of the campus community about issues surrounding stress management, mental illness, appropriate on/off campus resources, stigma, body image, helping a friend in distress, and other issues related to mental health and wellness, including bystander intervention. Programming is done in classroom settings, residence halls, and at tables during special events.
Prerequisite: Students must complete an interview before enrolling in this course.
Restriction: Permission of instructor; and minimum cumulative GPA of 2.5.
Credit Only Granted for: HLTH381 or PEER311.
Formerly: HLTH 381.
Additional Information: Students are required to attend a 40-hour training the week before classes begin which will equip them with the information and tools necessary to provide outreach as early as the first week of the Fall classes. Some evening and weekend hours may be required.

PEER312 Peer Education: Preventing Power-Based Violence (3 Credits)
Designed to train students to become Peer Educators who are responsible for presenting to members of the campus community about the complex dynamics surrounding issues of power-based personal violence. This includes: sexual assault, relationship violence, stalking, bystander intervention, consent, and rape culture. Students fully learn the on and off-campus resources for victim/survivors. Programming is done in classroom settings, residence halls, Greek life spaces, and at tables during special events.
Prerequisite: Students must complete an interview before enrolling in this course.
Restriction: Permission of instructor; and minimum cumulative GPA of 2.5.
Credit Only Granted for: HLTH382 or PEER312.
Formerly: HLTH382.
Additional Information: Students are required to attend a 40-hour training the week before classes begin which will equip them with the information and tools necessary to provide outreach as early as the first week of the Fall classes. Some evening and weekend hours may be required.

PEER313 Peer Education: Alcohol and Other Drugs Education (3 Credits)
Designed to train students to become Peer Educators who are responsible for presenting to members of the campus community about issues surrounding substance use, including (but not limited to) alcohol, marijuana, and various other drugs, providing information about campus services for those with substance use related issues, and educating students about other topics related to harm reduction strategies and promoting students' overall well-being, including bystander intervention. Programming is done in classroom settings, residence halls, and at tables during special events.
Prerequisite: Students must complete an interview before enrolling in this course.
Restriction: Permission of instructor; and minimum cumulative GPA of 2.5.
Credit Only Granted for: HLTH380 or PEER313.
Formerly: HLTH380.
Additional Information: Students are required to attend a 40-hour training the week before classes begin which will equip them with the information and tools necessary to provide outreach as early as the first week of the Fall classes. Some evening and weekend hours may be required.

PEER314 Peer Education: Sexual Health & Wellness (3 Credits)
Designed to train students to become Peer Educators who are responsible for presenting to members of the campus community about issues surrounding Sexually Transmitted Infections, sexual health testing and screening, birth control options, healthy sexuality, consent and communication, condoms and other barrier protection, campus sexual health services, and other issues related to sexual well being including bystander intervention. Programming is done in classroom settings, residence halls, and at tables during special events.
Prerequisite: Students must complete an interview before enrolling in this course.
Restriction: Permission of instructor; and minimum cumulative GPA of 2.5.
Credit Only Granted for: HLTH383 or PEER314.
Formerly: HLTH383.
Additional Information: Students are required to attend a 40-hour training the week before classes begin which will equip them with the information and tools necessary to provide outreach as early as the first week of the Fall classes. Some evening and weekend hours may be required.

PEER318 CARE Peer Advocacy (3 Credits)
Designed to train students to become Peer Advocates who are responsible for providing crisis and short-term support services for victims of sexual assault, relationship violence, stalking, sexual harassment and child abuse.Students will be meeting with clients and providing emotional support and resources (both on and off campus). During weekly classes, students will be trained in trauma-informed crisis intervention procedures that will not only help them assist clients during in- person sessions but will help them support clients via the crisis cell. Students will be expected to maintain the crisis cell (on a shared basis)throughout the semester as well as maintain 10 hours per week in the CARE office. In addition to maintaining the crisis cell and office hours, during the spring semester students will be tasked with working as a team in planning and executing a Take Back the Night event.
Prerequisite: Students must complete an interview before enrolling in this course; and permission of instructor.
Recommended: PSYC100 and HLTH377.
Restriction: Permission of instructor; and minimum cumulative GPA of 2.5; and students must sign up for the same course in the spring semester; and students are only permitted to enroll in the repeatable year long course once during their academic career. If students wish to continue working with the office after the course has been completed (Fall and Spring), they can do so on a volunteer basis; and must not have taken HLTH382 as a CARE Advocate course.
Repeatable to: 6 credits.
Additional Information: Students are required to attend a 40-hour training the week before classes begin which will equip them with the information and tools necessary to provide outreach as early as the first week of the Fall classes. Some evening and weekend hours may be required (crisis cell and special events).

PEER319 CARE to Stop Violence Outreach Peer Program (3 Credits)
A two semester, 6-credit course designed to train students in the knowledge, values and skills to build professional relationships and become leaders in community development related to the social justice issue of sexual misconduct with emphasis on the college campus environment.
Prerequisite: Permission of instructor; and students must complete an interview before enrolling in this course.
Restriction: Permission of instructor; and minimum cumulative GPA of 2.5; and students must sign up for the same course in the spring semester; and students are only permitted to enroll in the repeatable year long course once during their academic career. If students wish to continue working with the office after the course has been completed (Fall and Spring), they can do so on a volunteer basis; and must not have taken HLTH382 as a CARE Outreach course.
Repeatable to: 9 credits.
Formerly: HLTH382.
Additional Information: Students are required to attend a 40-hour training the week before classes begin which will equip them with the information and tools necessary to provide outreach as early as the first week of the Fall classes. Some evening and weekend hours may be required.

PEER321 Advanced Peer Education Mental Health and Wellness (3 Credits)
PEER 321 is a three-credit, interdisciplinary course building upon the stress management, mental illness, appropriate on/off campus resources, stigma, body image, helping a friend in distress, bystander intervention, and mental health/wellness knowledge gained during PEER 311. Students will gain a fundamental understanding of program planning basics through a series of assignments where they theoretically plan their own prevention or awareness program for the University of Maryland campus community. Students who become a Peer Leader during year two may have the opportunity to implement this program on campus. This course also provides advanced training in the skills necessary to serve as an effective Peer Educator under the University Health Center. Peer Educators will continue to provide outreach and education to the campus community through various outreach events, workshops, and more.
Prerequisite: Students must complete an interview before enrolling in this course; and minimum grade of B- in PEER311.
Restriction: Minimum cumulative GPA of 2.5; and permission of instructor.
Credit Only Granted for: HLTH381 or PEER321.
Formerly: HLTH381.
Additional Information: In addition to the weekly class lectures and experiential learning opportunities facilitating educational outreach on campus, advanced peer educators will meet weekly in groups. These group meetings will provide a space for the students to incorporate class content to enhance the design, development, and evaluation of a sexual assault prevention or awareness program for the University of Maryland campus community. Coordinators will meet with student groups to facilitate and supervise this process.

PEER322 Advanced Peer Education: Preventing Power-Based Violence (3 Credits)
PEER 322 is a three-credit, interdisciplinary course building upon the sexual assault, relationship violence, stalking, bystander intervention, and wellness knowledge gained during PEER 312. Students will gain a fundamental understanding of program planning basics through a series of assignments where they theoretically plan their own prevention or awareness program for the University of Maryland campus community. Students who become a Peer Leader during year two may have the opportunity to implement this program on campus. This course also provides advanced training in the skills necessary to serve as an effective Peer Educator under the University Health Center. Peer Educators will continue to provide outreach and education to the campus community through various outreach events, workshops, and more.
Prerequisite: Students must complete an interview before enrolling in this course; and minimum grade of B- in PEER312.
Restriction: Minimum cumulative GPA of 2.5; and permission of instructor.
Credit Only Granted for: HLTH382 or PEER322.
Formerly: HLTH382.
Additional Information: In addition to the weekly class lectures and experiential learning opportunities facilitating educational outreach on campus, advanced peer educators will meet weekly in groups. These group meetings will provide a space for the students to incorporate class content to enhance the design, development, and evaluation of a sexual assault prevention or awareness program for the University of Maryland campus community. Coordinators will meet with student groups to facilitate and supervise this process.

PEER323 Advanced Peer Education: Alcohol and Other Drugs Education (3 Credits)
PEER 323 is a three-credit, interdisciplinary course building upon the alcohol and other drugs (AOD) education knowledge gained during PEER 313. Students will gain a fundamental understanding of program planning basics through a series of assignments where they theoretically plan their own wellness program for the University of Maryland campus community. Students who become Peer Leaders during year two (PEER338) may have the opportunity to implement this program on campus. This course also provides advanced training in the skills necessary to serve as an effective Peer Educator under the University Health Center. Peer Educators will continue to provide outreach and education to the campus community through various outreach events, workshops, and more.
Prerequisite: Students must complete an interview before enrolling in this course; and minimum grade of B- in PEER313.
Restriction: Minimum cumulative GPA of 2.5; and permission of instructor.
Credit Only Granted for: HLTH380 or PEER323.
Formerly: HLTH380.
Additional Information: In addition to the weekly class lectures and experiential learning opportunities facilitating educational outreach on campus, advanced peer educators will meet weekly in groups. These group meetings will provide a space for the students to incorporate class content to enhance the design, development, and evaluation of an alcohol and other drugs education program for the University of Maryland campus community. Coordinators will meet with student groups to facilitate and supervise this process.

PEER324 Advanced Peer Education: Sexual Health & Wellness (3 Credits)
PEER 324 is a three-credit, interdisciplinary course building upon the sexual health and wellness knowledge gained during PEER 314. Students will gain a fundamental understanding of program planning basics through a series of assignments where they theoretically plan their own wellness program for the University of Maryland campus community. Students who become Peer Leaders during year two (PEER338) may have the opportunity to implement this program on campus. This course also provides advanced training in the skills necessary to serve as an effective Peer Educator under the University Health Center. Peer Educators will continue to provide outreach and education to the campus community through various outreach events, workshops, and more.
Prerequisite: Students must complete an interview before enrolling in this course; and minimum grade of B- in PEER314.
Restriction: Minimum cumulative GPA of 2.5; and permission of instructor.
Credit Only Granted for: HLTH383 or PEER324.
Formerly: HLTH383.
Additional Information: In addition to the weekly class lectures and experiential learning opportunities facilitating educational outreach on campus, advanced peer educators will meet weekly in groups. These group meetings will provide a space for the students to incorporate class content to enhance the design, development, and evaluation of a sexual health and wellness program for the University of Maryland campus community. Coordinators will meet with student groups to facilitate and supervise this process.

PEER338 PEER LEADERSHIP AND EDUCATION (3 Credits)
An interdisciplinary independent study designed to enhance the scope of learning around UHC peer education topics and train students to serve as leaders for those enrolled in first year peer courses, PEER31X and PEER32X. Second year peers are trained to facilitate intersectional and advanced health education dialogue, as well as serve in leadership roles for the course in which they were previously enrolled, PEER31X and PEER32X. Additionally, Peer Leader responsibilities include creating and implementing campus wide events to promote learning around the intersections between UHC peer education group topics (power-based violence, sexual health, alcohol and other drugs, stress and mental health). Peer Leaders will have different responsibilities based on the programmatic needs and goals of the semester.
Prerequisite: 1 course with a minimum grade of B- from (PEER321, PEER322, PEER323, PEER324).
Restriction: Minimum cumulative GPA of 3.0.
Repeatable to: 6 credits.

PERS - Persian

PERS101 Elementary Persian I (4 Credits)
Introduction to the alphabet, pronunciation patterns, greetings, basic structures, and other fundamentals, with emphasis on oral and aural skills.
Prerequisite: Must have appropriate World Language Placement (WLP) score.
Restriction: Must not be native/fluent speaker of Persian.

PERS102 Elementary Persian II (4 Credits)
Continuation of PERS101 with emphasis on the use of formal language, vocabulary building, and reading.
Prerequisite: PERS101; or must have appropriate World Language Placement (WLP) score.
Restriction: Must not be native/fluent speaker of Persian.

PERS103 Beginning Persian I (3 Credits)
Introduction to the fundamental grammatical structures, phonology, and orthography. Students work toward developing foundational communicative and interactional competence in Persian.
Restriction: Must not be a native/fluent speaker of Persian. Native/fluent speakers of Persian or students who have previously attended school in Persian speaking countries should take the World Language Placement (WLP) and see the Persian Program Advisor to identify the correct Persian course for which to register.
Credit Only Granted for: PERS101 or PERS103.

PERS104 Beginning Persian II (3 Credits)
Continuation of PERS103 with sustained emphasis on the simultaneous development of structural and communicative competence in Persian.
Prerequisite: PERS103; or must have appropriate World Language Placement (WLP) score.
Restriction: Must not be a native/fluent speaker of Persian. Native/fluent speakers of Persian or students who have previously attended school in Persian speaking countries should take the World Language Placement and see the Persian Program Advisor to identify the correct Persian course for which to register.
Credit Only Granted for: PERS102 or PERS104.

PERS105 Intensive Elementary Persian I (6 Credits)
Intensive training in spoken and written Persian at elementary level. Basic literacy skills, vocabulary, pronunciation and grammar developed through a highly interactive approach. Substantial cultural component familiarizing students with cultural themes related to Iran and the Persian speaking world. Taught in Persian.
Prerequisite: Must have appropriate World Language Placement (WLP) score.
Restriction: Open to beginning learners of Persian only.

PERS106 Intensive Elementary Persian II (6 Credits)
Intensive training in spoken and written Persian at elementary level (ACTFL Novice High to Intermediate Low). Continues building basic literacy skills, vocabulary, and grammar through highly a interactive approach. Substantial cultural component familiarizing students with cultural themes related to Iran and the Persian speaking world. Taught in Persian.
Prerequisite: Pre-requisite: PERS105, or equivalent, as determined by the World Language Placement (WLP).

PERS201 Intermediate Persian I (3 Credits)
Development of speaking, reading, writing, listening and cultural knowledge through wide variety of activities.
Prerequisite: PERS102; or must have appropriate World Language Placement (WLP).
Restriction: Must not be native/fluent speaker of Persian.

PERS202 Intermediate Persian II (3 Credits)
Further development of speaking, writing, listening and cultural knowledge, with special focus on culture.
Prerequisite: PERS201; or must have appropriate World Language Placement (WLP).
Restriction: Must not be native/fluent speaker of Persian.

PERS205 Intensive Intermediate Persian I (6 Credits)
Development of Persian language proficiency and cultural knowledge at the intermediate level (Intermediate-Mid on ACTFL scale). Taught in Persian.
Prerequisite: PERS106; or equivalent as determined by World Language Placement (WLP).

PERS206 Intensive Intermediate Persian II (6 Credits)
Designed to further develop Persian language proficiency and cultural knowledge at an intermediate level (Intermediate High on ACTFL scale). Taught in Persian.
Prerequisite: PERS205; or equivalent, as determined by the World Language Placement (WLP).

PERS211 Intermediate Conversation (3 Credits)
Development of aural and oral skills in Persian. Various genres and registers of speech. Special focus on contemporary daily life, with use of up-to-date media sources.
Prerequisite: PERS102; or students who have taken courses with comparable content may contact the department.
Recommended: Concurrent enrollment in PERS201.

PERS251 Modern Iran (3 Credits)
General sociopolitical introduction to modern Iran from establishment of the Qajar dynasty in the late 18th century to the present day. Taught in English.
Cross-listed with: HIST219X.
Credit Only Granted for: PERS251 or HIST219X.

PERS252 Gender and Body in Iran (3 Credits)
Multidisciplinary approach to key topics concerning gender and body in Iran, to include insights from religion, history, sociology, anthropology, disability studies, travel literature, arts, and fashion. Taught in English.
Credit Only Granted for: WMST298J, or PERS252.

PERS269 Special Topics in Study Abroad II (1-6 Credits)
Special topics course taken as part of an approved study abroad program.
Repeatable to: 15 credits if content differs.

PERS280 Art Activism in Iran (3 Credits)
Explores Iranian artists' intent and hope for change and their critical and playful strategies of making a difference through their visual or performing arts created since 1980. While exploring key concepts, contexts, and debates by examining a variety of artworks, we explore diverse and unique transgressive stories, strategies, and styles that these works present to address themes of social justice through the art. We examine how multimedia art forms (dance, theatre, cinema, painting, digital art, and music) empower Iranian artists to practice their identity and exercise their agency as these aspects intersect with race, ethnicity, class, sexuality, ability, and education in a shifting and multilayered context.
Credit Only Granted for: PERS289M, ARTH389O, or PERS280.
Formerly: PERS298M.

PERS283 Iranian Cinema (3 Credits)
Introduction to Iranian cinema, society, and culture. Taught in English.
Cross-listed with: CINE283.
Credit Only Granted for: PERS283, CINE283 or FILM298B.

PERS298 Special Topics in Persian Studies (1-3 Credits)
Special topic to be announced when course is offered.
Repeatable to: 9 credits if content differs.

PERS299 Directed Study in Persian Language (1-3 Credits)
Directed study in Persian. Taught in Persian.
Prerequisite: PERS202; or permission of ARHU-School of Languages, Literatures, and Cultures department.

PERS301 Advanced Persian I (3 Credits)
Development of speaking, reading, writing, listening and cultural knowledge through wide variety of activities, especially reading.
Prerequisite: PERS202; or permission of ARHU-School of Languages, Literatures, and Cultures department.
Restriction: Must not be native/fluent speaker of Persian.

PERS302 Advanced Persian II (3 Credits)
Further development of speaking, reading, writing, listening and cultural knowledge, with special focus on reading, in a variety of literary genres.
Prerequisite: PERS301; or students who have taken courses with comparable content may contact the department.
Restriction: Must not be native/fluent speaker of Persian.

PERS305 Intensive Advanced Persian I (6 Credits)
Development of Persian language proficiency and cultural competence at an advanced level (Advanced Low on ACTFL scale). Taught in Persian.
Prerequisite: Must have completed PERS206; or equivalent as determined by World Language Placement (WLP).

PERS306 Intensive Advanced Persian II (6 Credits)
Continued development of Persian language proficiency at an Advanced Mid level on ACTFL scale through a whole language approach integrating listening, speaking, reading and writing. Taught in Persian.
Prerequisite: PERS305; or equivalent as determined by World Language Placement (WLP).

PERS311 Persian Media (3 Credits)
Examines issues, values, institutions of the contemporary Persian and Persianete world, primarily through analysis and discussion of current events as reported in the written and audiovisual press. Focus will be on increasing content knowledge as well as linguistic competency in Persian. Taught in Persian.
Prerequisite: PERS301; or permission of ARHU-School of Languages, Literatures, and Cultures department.

PERS312 Contemporary Iranian Culture (3 Credits)
Study of the culture of contemporary Iran (post-evolution) with focus on the contemporary social, political, literary and artistic life in Iran. Taught in Persian.
Prerequisite: PERS301; or students who have taken courses with comparable content may contact the department.
Restriction: Must not be native/fluent speaker of Persian.

PERS353 Iranian Life in Literature and Film (3 Credits)
Treats major themes in modern literature and life of Iranians. Topics examined include Iranian identity, religious traditions, modern life, and expatriate communities. Taught in English.

PERS369 Special Topics in Study Abroad III (1-6 Credits)
Special topics course taken as part of an approved study abroad program.
Repeatable to: 15 credits if content differs.

PERS371 Introduction to Persian Literature in Translation (3 Credits)
Introduction to classical and modern canons of Persian literature in historical, esthetic, and social context. Taught in English.

PERS385 Theatre and Dance in Iran and Afghanistan (3 Credits)
Students will learn about stories, plays, and movements in Iran and Afghanistan from past to present. Through watching performances, readings, and discussions, we explore the relationship between storytelling, body, space, and power in forming and performing identity and life experiences. Looking at case studies from traditional, popular, and western style dance and theater are an exciting part of the course. Note: This course requires no prior knowledge of Persian culture or dance and theatre studies on the part of the students.
Cross-listed with: TDPS358A, THET328W.
Repeatable to: 3 credits if content differs.
Credit Only Granted for: TDPS358A, THET328W, PERS398A, or PERS385.
Formerly: PERS398A.

PERS386 Experiential Learning (3-6 Credits)
Pre-professional experience in research, analysis and writing in a work setting. Project proposal approved by faculty and internship sponsor.
Restriction: Permission of ARHU-School of Languages, Literatures, and Cultures department.

PERS398 Special Topics in Persian Studies (1-3 Credits)
Special topic to be announced when course is offered. Taught in Persian.
Prerequisite: PERS301; or permission of ARHU-School of Languages, Literatures, and Cultures department.

PERS399 Directed Study in Persian (1-3 Credits)
Directed study with faculty supervision.
Prerequisite: Permission of ARHU-School of Languages, Literatures, and Cultures department.
Restriction: Sophomore standing or higher.
Repeatable to: 9 credits if content differs.

PERS405 Media and the Current Issues in Iranian Society (6 Credits)
Develops Persian language proficiency and domain-specific knowledge at advanced-mid to advanced-high level on ACTFL scale. Enhances linguistic and cultural competence. Provides a broad understanding of some of the current social, political and economic issues in modern Iran. Taught in Persian.
Prerequisite: PERS306; or equivalent as determined by World Language Placement (WLP).

PERS406 Practicum in Persian Translation (6 Credits)
Provides opportunities for translation, interpretation, and analysis of various authentic oral and written texts (both English to Persian and Persian to English). Facilitates the development of Persian language proficiency at advanced level through a task-based approach that integrates all the language skills in pedagogical translation activities.
Prerequisite: PERS306; or equivalent as determined by the World Language Placement (WLP).

PERS411 Readings in Iranian Islam (3 Credits)
In-depth study of Iranian Islam via Islamic texts. Develops competency in speaking, reading, writing, and listening comprehension at advanced level. Taught in Persian.
Prerequisite: Permission of ARHU-School of Languages, Literatures, and Cultures department.

PERS498 Special Topics in Persian Studies (3 Credits)
Topic and language to be announced when offered.
Prerequisite: Permission of instructor.
Repeatable to: 9 credits if content differs.

PHIL - Philosophy

PHIL100 Introduction to Philosophy (3 Credits)
An introduction to the literature, problems, and methods of philosophy either through a study of some of the main figures in philosophic thought or through an examination of some of the central and recurring problems of philosophy.

PHIL140 Contemporary Moral Issues (3 Credits)
The uses of philosophical analysis in thinking clearly about such widely debated moral issues as abortion, euthanasia, homosexuality, pornography, reverse discrimination, the death penalty, business ethics, sexual equality, and economic justice.

PHIL170 Introduction to Symbolic Logic (3 Credits)
This course will introduce the basic concepts and techniques of modern symbolic logic, with an emphasis on developing skills in two areas: first, translating between ordinary language and logical notation; second, establishing the validity or invalidity of arguments using the methods of truth tables, deductions, and countermodels. Although the subject of symbolic logic was developed by mathematicians and philosophers for their own special purposes (which we will discuss), logical concepts and techniques have found applications in a variety of disciplines, including computer science, economics, law, linguistics, and psychology. We may also consider some of these applications.

PHIL171 Reasoning For Humans: Clear Thinking in an Uncertain World (3 Credits)
Reasoning is a transition in thought in which some beliefs or thoughts provide grounds or reasons for others. What makes certain transitions of thought rational or reasonable and others irrational or erratic is a major focus of investigation in diverse research areas, such as philosophy, logic, artificial intelligence, cognitive science, and psychology. This course is an introduction to logic and probability with a focus on applications to the study of the foundations of human reasoning.
Credit Only Granted for: PHIL171 or PHIL218A.
Formerly: PHIL218A.

PHIL201 Spooky Action at a Distance? Where Physics Meets Metaphysics (3 Credits)
Einstein believed that physics should represent a "reality in space and time, free from spooky action at a distance." He worried that quantum theory failed this test. Later developments suggest that quantum systems really can influence one another instantly, no matter how far apart they are, but the question remains controversial and experiments are not sufficient to provide an answer. This self-contained course will draw on philosophy and physics to investigate the controversy.
Recommended: Students should be comfortable with moderately mathematical presentations. Placement into MATH110 or higher is strongly recommended.
Credit Only Granted for: PHIL201 or PHIL209I.
Formerly: PHIL209I.

PHIL202 Know Thyself: Wisdom Through Cognitive Science (3 Credits)
How do we improve our decision making? Cognitive science demonstrates that self-knowledge isn't as easy as we think, and that there are numerous biases and fallacies that impact our decision-making in ways that are hard for us to be aware of. In this course you will learn what some of these are and how they have been discovered, and you will explore potential strategies for avoiding these fallacies and for making wiser choices.
Credit Only Granted for: PHIL209N or PHIL202.
Formerly: PHIL209N.

PHIL203 The Rights and Wrongs of Killing People (3 Credits)
Virtually everyone thinks it's permissible to kill people only in special circumstances. But why is killing usually wrong? Is it ever acceptable to kill an innocent human being intentionally? This course raises these and related questions and examines cases such as terrorism, suicide, abortion, euthanasia, the death penalty, war. Except for a brief discussion of animals, all the controversies considered deal with killing and causing death to human beings.
Credit Only Granted for: PHIL209J or PHIL203.
Formerly: PHIL209J.

PHIL204 Happiness (3 Credits)
What does the discipline of philosophy teach us about happiness? This course explores how philosophers have addressed questions about the nature of happiness and its role in the good human life. Questions to be addressed include: what is it to be happy? What social, economic, and political institutions foster and support human happiness? Can an immoral person be happy? And is a happy life the same as a meaningful life?
Credit Only Granted for: PHIL209E or PHIL204.
Formerly: PHIL209E.

PHIL205 Are Sports Ethical? (3 Credits)
Things happen routinely in sports that would seem morally unacceptable in other context: violence between the participants, attempts to trick the referee, fans hoping that some players would do embarrassingly badly, spectators feeling anger towards whole nations. Nonetheless, all of this may seem reasonable and even justifiable within a sporting context. This course will investigate the ethical structure of sports, and what it tells us about the ethics of everyday life. Philosophy will provide the primary disciplinary context, but we will also think about sociological, legal and anthropological perspectives on sports. Issues will include the nature of sportsmanship, what types of violence in sports are acceptable, drug use in sports, what it means to be a fan (for example, asking why loyalty to your team is valuable) and how our view of sports interacts with our view of nations. By the end of the course you should have gained familiarity with a variety of ethical concepts and a sensitivity to the ethical issues in sports. You should also find that by thinking about morality in the context of sports, you will look at larger ethical issues in new ways.
Credit Only Granted for: PHIL205, PHIL209G, or HONR229E.
Formerly: HONR229E.

PHIL209 Philosophical Issues (3 Credits)
An examination of selected philosophical issues of general interest.
Repeatable to: 6 credits if content differs.

PHIL210 Philosophy of the Universe (3 Credits)
An exploration of how philosophy can help us understand our place in the cosmos. The course covers a variety of topics at the intersection of science and philosophy, such as: How does the world we observe emerge from the microscopic world science tells us about? What are laws of nature? What is time? What is life? The emphasis is not on leading students to particular conclusions about these topics. Instead, it is to learn how to ask these questions critically and to understand what would count as relevant evidence for an answer.
Credit Only Granted for: PHIL209U or PHIL210.
Formerly: PHIL209U.

PHIL211 AI & ETHICS (3 Credits)
An introduction to a major subfield of contemporary Philosophy, namely applied ethics, and the experience of using some major tools in the practice of philosophy more generally, namely, the construction and formal evaluation of arguments, conceptual analysis, the use of thought experiments, and clear, direct and persuasive writing. Learning how to execute the latter will involve an intense iterative process. The substantive focus of the course will be the ethical evaluation of Artificial Intelligence (AI) in some of its current and potentially future incarnations. We'll examine algorithmic opacity, algorithmic bias and decision-making, autonomous weapons systems, human-robot interaction, and artificial moral agents, in order to uncover what, if any, ethical issues they give rise to.
Credit Only Granted for: PHIL209D or PHIL211.
Formerly: PHIL209D.

PHIL218 Issues in in Epistemology/Metaphysics (3 Credits)
An examination of selected philosophical issues in epistemology or metaphysics.
Repeatable to: 12 credits if content differs.
Additional Information: Counts toward the epistemology/metaphysics requirement for the Philosophy major.

PHIL220 Bioethics: Regulating Right and Wrong (3 Credits)
Bioethicists formulate ethical guidelines. They answer questions such as: When life-saving health resources are scarce, who should get them? Should we increase supply of one such resource, kidneys, by buying them from living "donors"? If drug trials in developing countries benefit patients who consent to participate, are the trials ethical, even if the same research would be forbidden in the US? If a sick person aims to hasten her death, how, if at all, might her doctor permissibly help her? In this course, students construct and defend ethical rules in four domains: research ethics, allocation of scarce resources, markets in organs, and physician-assisted dying.
Credit Only Granted for: PHIL209A or PHIL220.
Formerly: PHIL209A.

PHIL228 Issues in History of Philosophy (3 Credits)
An examination of selected issues in the history of philosophy.
Repeatable to: 12 credits if content differs.
Additional Information: Counts toward the history of philosophy requirement for the Philosophy major.

PHIL234 Fundamental Concepts of Judaism (3 Credits)
A conceptional introduction to Judaism, analyzing its fundamental concepts from both analytical and historical perspectives. Discussion of "normative" Judaism as well as other conceptions of Judaism. Topics include: God, the Jewish people, authority, ethics, the sacred and the profane, particularism and universalism.
Cross-listed with: JWST250, RELS250.
Credit Only Granted for: JWST250, PHIL234, or RELS250.

PHIL235 Authority, Faith, and Reason in Judaism (3 Credits)
A broad survey of the concepts of authority, faith, and reason in Jewish tradition from the Bible to the modern period, and their interrelationships.

PHIL236 Philosophy of Religion (3 Credits)
A philosophical study of some of the main problems of religious thought: the nature of religious experience, the justification of religious belief, the conflicting claims of religion and science, and the relation between religion and morality.
Cross-listed with: RELS236.
Credit Only Granted for: PHIL236 or RELS236.

PHIL238 Issues in Value Theory (3 Credits)
An examination of selected issues in ethics, aesthetics, political philosophy and related areas.
Repeatable to: 12 credits if content differs.
Additional Information: Counts toward the value theory requirement for the Philosophy major.

PHIL245 Political and Social Philosophy I (3 Credits)
A critical examination of such classical political theories as those of Plato, Hobbes, Locke, Rousseau, Mill, Marx, and such contemporary theories as those of Hayek, Rawls, and recent Marxist thinkers.

PHIL250 Philosophy of Science I (3 Credits)
Main issues in the philosophy of science. Special attention to the ways scientific developments have influenced the philosophy of science and how philosophy of science has influenced scientific progress. Case studies of selected historical episodes in which science and philosophy have interacted significantly, focusing on the physical, biological, or social sciences.

PHIL261 Philosophy of the Environment (3 Credits)
An evaluation of different kinds of arguments for the claim that the natural environment should be preserved. Perspectives cut across the disciplines of philosophy (environmental ethics and philosophies of nature); economics (cost-benefit analysis); and biology (evolution, ecology, environmental studies).
Credit Only Granted for: HONR218F or PHIL261.
Formerly: HONR218F.

PHIL269 Speical Topics in Study Abroad II (1-6 Credits)
Special topics course taken as part of an approved study abroad program.
Repeatable to: 15 credits if content differs.

PHIL271 Symbolic Logic (3 Credits)
This course provides students with a thorough treatment of the basic concepts and techniques of modern symbolic logic, through classical first-order logic with identity. We will concentrate on the construction of natural deduction proofs and on the evaluation of logical statements in semantic models. Along the way, we will study some of the concepts from set theory (sets, functions, relations) used in the definition of semantic models for logical systems. We may also introduce some alternative, or non-classical logics. Although the subject of symbolic logic was developed by mathematicians and philosophers for their own special purposes (which we will discuss), logical concepts and techniques have found applications in a variety of disciplines, including computer science, economics, law, linguistics, and psychology. We may also consider some of these applications.
Recommended: PHIL170.

PHIL282 Free Will & Determinism (3 Credits)
A study of the main positions and arguments in the free will debate in contemporary analytic philosophy.

PHIL308 Studies in Contemporary Philosophy (3 Credits)
Problems, issues, and points of view of current interest in philosophy.
Prerequisite: 6 credits in PHIL courses.
Repeatable to: 6 credits if content differs.

PHIL309 Philosophical Problems (3 Credits)
A focused study of a contemporary philosophical problem or issue. Topics will vary, but the course will encourage students to to generate critical analyses or proposed resolutions of issues in the contemporary philosophical literature.
Prerequisite: 6 credits in PHIL courses.
Repeatable to: 12 credits if content differs.

PHIL310 Ancient Greek and Roman Philosophy (3 Credits)
A study of the origins and development of philosophy in ancient Greece and Rome, focusing on Socrates, Plato, Aristotle, the Epicureans, and Stoics.
Prerequisite: Must have completed 6 credits in philosophy or classics.
Cross-listed with: CLAS310, PHPE308Y.
Credit Only Granted for: PHIL310, CLAS310, or PHPE308Y.

PHIL313 From the Stoa to Silicon Valley: Ancient and Modern Approaches to Stoic Philosophy (3 Credits)
Stoicism, ancient Rome's most popular philosophy, posited that virtue is the only human good and that individuals must detach themselves emotionally from the material world in order to live ethical lives. Principles of Stoic philosophy will be explored together with the wide array of artistic, political, and intellectual traditions that have drawn inspiration from it, from the Haitian revolutionary movement of the late 18th century, to the sexist "manosphere" of Reddit and Twitter, to modern cognitive-behavioral therapy.
Cross-listed with: CLAS313, PHPE313.
Credit Only Granted for: CLAS313, PHIL313, or PHPE313.

PHIL318 Studies in Epistemology/Metaphysics (3 Credits)
Problems, issues, and points of view in epistemology or metaphysics.
Prerequisite: 1 course in PHIL.
Repeatable to: 12 credits if content differs.
Additional Information: Counts toward the epistemology/metaphysics requirement for the Philosophy major.

PHIL320 Knowing Oneself and Knowing the World: Early Modern Philosophy from Descartes to Kant (3 Credits)
A study of major philosophical issues of the 16th, 17th, and 18th centuries through an examination of such philosophers as Descartes, Spinoza, Leibniz, Cavendish, Locke, Berkeley, Hume and Kant
Prerequisite: 6 credits in PHIL courses; or permission of instructor.

PHIL328 Studies in the History of Philosophy (3 Credits)
Problems, issues, and points of view in the history of philosophy.
Prerequisite: 6 credits in PHIL courses.
Repeatable to: 6 credits if content differs.

PHIL332 Philosophy of Beauty (3 Credits)
Philosophical theories, historical and contemporary, of beauty, sublimity, and other aesthetic qualities, of aesthetic experience, and of aesthetic judgment.
Prerequisite: 3 courses in PHIL; or permission of ARHU-Philosophy department.

PHIL338 Studies in Value Theory (3 Credits)
Problems, issues and points of view in ethics, aesthetics, political philosophy and related areas.
Prerequisite: 1 course in PHIL.
Repeatable to: 12 credits if content differs.
Additional Information: Counts toward the value theory requirement for the Philosophy major.

PHIL341 Ethical Theory (3 Credits)
A critical examination of classical and contemporary systems of ethics, such as those of Aristotle, Kant, Mill, and Rawls.
Prerequisite: 6 credits in PHIL courses.

PHIL344 Philosophy of Race (3 Credits)
A survey of philosophical arguments involving race and racism. Guiding questions will include: How have philosophers and scientists conceived of the concept of race? Is race a coherent concept? Does it help us explain differences in performance and behavior? What makes racism, racial prejudice, and discrimination wrong? What is the point of equality? Do we owe reparations to victims of racism?
Credit Only Granted for: PHIL344 or PHIL308Y.
Formerly: PHIL308Y.

PHIL347 Philosophy of Law (3 Credits)
Examination of fundamental concepts related to law, e.g. legal systems, law and morality, justice, legal reasoning, responsibility.
Credit Only Granted for: PHIL347 or PHIL447.
Formerly: PHIL447.

PHIL360 Philosophy of Language (3 Credits)
The nature and function of language and other forms of symbolism from a philosophical perspective.
Prerequisite: LING311; or 2 courses in PHIL and (PHIL170 or PHIL370); or permission of ARHU-Philosophy department.
Cross-listed with: LING350.
Credit Only Granted for: LING350 or PHIL360.

PHIL362 Theory of Knowledge (3 Credits)
Some central topics in the theory of knowledge, such as perception, memory, knowledge, and belief, skepticism, other minds, truth, and the problems of induction.
Prerequisite: 6 credits in PHIL courses; and PHIL170.
Formerly: PHIL462.

PHIL364 Metaphysics (3 Credits)
The study of some central metaphysical concepts and issues including the nature and validity of metaphysical thinking, universals, identity, substance, time, God, and reality.
Prerequisite: 6 credits in PHIL courses.
Formerly: PHIL464.

PHIL366 Philosophy of Mind (3 Credits)
An introduction to core issues in the philosophy of mind, focusing especially on the basic metaphysical question of dualism versus physicalism.
Prerequisite: 6 credits in PHIL courses.

PHIL369 Special Topics in Study Abroad III (1-6 Credits)
Special topics course taken as part of an approved study abroad program.
Repeatable to: 15 credits if content differs.

PHIL370 Logical Theory I: Metatheory (3 Credits)
This course is an introduction to logical "metatheory", that is, to logical reasoning about logic systems themselves. Topics include alternative alternative proof-theoretic presentations of logical systems as well as soundness and completeness theorems for propositional and first-order logic. Along the way, we will deepen our understanding of the elementary set-theoretic concepts underlying first order logic. Other topics may include basic results in the semantics of first order logic (such as the Craig interpolation theorem, the Beth definability theorem, or the Lowenhein-Skolem theorem).
Prerequisite: PHIL271 or CMSC250; or permission of the instructor.

PHIL386 Experiential Learning (3-6 Credits)
Restriction: Permission of ARHU-Philosophy department; and junior standing or higher.

PHIL408 Topics in Contemporary Philosophy (3 Credits)
An intensive examination of contemporary problems and issues. Source material will be selected from recent books and articles.
Repeatable to: 99 credits if content differs.

PHIL409 Advanced Studies in Contemporary Philosophy (3 Credits)
An in-depth study of a contemporary philosophical problem or issue. Topics will vary, but the course will encourage students to grapple with the primary literature in order to generate sustained critical analyses or proposed resolutions of issues under active consideration in contemporary philosophy.
Prerequisite: 6 credits in PHIL courses.
Repeatable to: 12 credits if content differs.

PHIL412 The Philosophy of Plato (3 Credits)
A critical study of selected dialogues.
Prerequisite: 6 credits in PHIL courses.

PHIL414 The Philosophy of Aristotle (3 Credits)
A critical study of selected portions of Aristotle's writings.
Prerequisite: 6 credits in PHIL courses.

PHIL417 The Golden Age of Jewish Philosophy (3 Credits)
Jewish philosophy from Maimonides in the 12th century to the expulsion of the Jews from Spain at the end of the 15th Century. Topics include the limitations of human knowledge, creation of the world, foreknowledge and free will, and the existence of God.
Prerequisite: 3 credits in PHIL courses; or permission of ARHU-Meyerhoff Program & Center for Jewish Studies; or permission of ARHU-Philosophy department.
Cross-listed with: JWST452.
Credit Only Granted for: JWST452 or PHIL417.

PHIL418 Topics in Epistemology/Metaphysics (3 Credits)
An intensive examination of contemporary problems and issues in epistemology or metaphysics. Source material will be selected from recent books and articles.
Prerequisite: 2 courses in PHIL.
Repeatable to: 12 credits if content differs.

PHIL428 Topics in the History of Philosophy (3 Credits)
Prerequisite: PHIL310 and PHIL320; or permission of ARHU-Philosophy department.
Repeatable to: 99 credits if content differs.

PHIL438 Topics in Value Theory (3 Credits)
An intensive examination of contemporary problems and issues in ethics, aesthetics, political philosophy and related areas. Source material will be selected from recent books and articles.
Prerequisite: 2 courses in PHIL.
Repeatable to: 12 credits if content differs.

PHIL440 Contemporary Ethical Theory (3 Credits)
Contemporary work on fundamental problems in ethical theory, such as whether there are moral truths, whether and how our moral claims can be justified, what exactly makes an act right or wrong, the nature of moral language, and the role of reason and emotion in moral judgment.
Prerequisite: PHIL341; or permission of instructor.

PHIL443 Moral Psychology (3 Credits)
Philosophers often stress reasoning as the appropriate source for practical and moral action. Would a realistic view of human psychology undermine this assumption? This course will examine recent philosophical and empirical work on the relevance of emotion and/or intuition to rationality, moral worth, and moral judgment.
Prerequisite: 2 courses in PHIL.
Recommended: PHIL341 is strongly recommended for background on the historical authors that the readings make reference to.
Credit Only Granted for: PHIL408P or PHIL443.
Formerly: PHIL408P.

PHIL445 Contemporary Political Philosophy (3 Credits)
Major trends in contemporary political philosophy: liberal, libertarian, communitarian, socialist, feminist.
Restriction: Must have completed 3 credits in philosophy or political theory; or permission of ARHU-Philosophy department. And sophomore standing or higher.

PHIL446 Law, Morality, and War (3 Credits)
An exploration of fundamental moral and legal issues concerning war.

PHIL453 Philosophy of Science II (3 Credits)
A comprehensive survey of developments in the main problems of the philosophy of science from logical positivism to the present. The nature of theories, models, laws, and counterfactuals, testing, inductive logic, and confirmation theory, experimental methodology, measurement, explanation, concept formation, growth of scientific knowledge, and scientific realism.
Prerequisite: Students must have completed a minium of two philosophy courses.

PHIL458 Topics in the Philosophy of Science (3 Credits)
A detailed examination of a particular topic or problem in philosophy of science.
Repeatable to: 6 credits if content differs.

PHIL469 Study Abroad Special Topics IV (1-6 Credits)
Special topics course taken as part of an approved study abroad program.
Repeatable to: 15 credits if content differs.

PHIL470 Logical Theory II: Incompleteness and Undecidability (3 Credits)
Introduces the formal theory of computation, and then presents the the central limitative results of modern first-order logic: Church's undecidability theorem and Godel's first and second incompleteness theorems. The primary focus of the course is a thorough technical study of these fundamental results, but we will also discuss some of the philosophical issues they raise. Further topics may include second-order logic.
Prerequisite: PHIL370; or permission of instructor.

PHIL478 Topics in Philosophical Logic (3 Credits)
Philosophical logics result from the application of formal techniques to problems of philosophical interest; these logics often have applications in other areas as well, such as AI, linguistics, psychology, economics, and law. This course will either concentrate on a particular family of philosophical logics (such as modal or temporal or defeasible logics) or else survey a number different logical systems.
Prerequisite: PHIL271; or permission of instructor.
Recommended: PHIL470.
Repeatable to: 9 credits if content differs.

PHIL488 Topics in Philosophy of Cognitive Studies (3 Credits)
Examination of a particular topic or problem in philosophy of cognitive studies.
Prerequisite: 3 credits in PHIL courses; or permission of ARHU-Philosophy department.
Repeatable to: 9 credits if content differs.

PHIL489 Undergraduate Seminar in Philosophy (3-6 Credits)
An intensive examination of a philosophical topic or topics.
Restriction: Permission of ARHU-Philosophy department.
Repeatable to: 6 credits if content differs.

PHIL490 The Practice of Philosophy: How To Develop Your Own Work (3 Credits)
Writing philosophical papers, presenting them to an audience, and responding critically and constructively to the papers and talks of others are skills central to the practice of philosophy. This course will help students to enhance those skills in a seminar-style format. Students should come to the course with a paper of their own (likely from another course) that they would like to develop.
Prerequisite: Three upper-level (300- or 400-level) courses in philosophy or permission of the instructor.
Credit Only Granted for: PHIL408R or PHIL490.
Formerly: PHIL408R.

PHIL498 Topical Investigations (1-3 Credits)

PHIX - Philosophy Education Abroad

PHIX301 Philosophy of Technology and Human Values (3 Credits)
In our age, it is undeniable that human beings are technological creatures. Techne, that is, artful craftsmanship, has increasingly been enhancing our experiences, fulfilling our desires, and broadening our abilities, both on a large scale and in the daily lives of individuals. Do we control technology or does it control us? Is technology part of nature or an instrument to human ends? How can we respond critically to the use and development of technology? In this course, we examine such pressing questions from specifically Scandinavian, ethical, social, environmental, and philosophical perspectives.
Additional Information: This course is offered as part of the Maryland-in-Stockholm study abroad program. Students must apply for this program through Education Abroad: More information at ter.ps/UMStockholm. Education Abroad processes registrations for this course on behalf of students.

PHIX306 Machiavelli Today: Politics, Sociability, Self-fashioning, Cinema, and Graphic Novels (3 Credits)
Takes students from the center of Florence, where Machiavelli was listening to a sermon by a theocratic leader, Girolamo Savonarola, and concluded that it was wrong to mix religion with politics. This principle was to guide Machiavelli's political thought and remained at the core of his teachings. For this reason, Machiavelli has been, and still is, both reviled for the content of his observations, and admired for the clarity of his exposition. Both the author and his books have been a constant presence in Western civilization, with regular patterns of rejection and acceptance, since moral principles have always been sacrificed for a supposed better good.
Additional Information: This course is offered as part of the Maryland-in-Florence study abroad program. Students must apply for this program through Education Abroad: More information at ter.ps/UMFlorence. Education Abroad processes registrations for this course on behalf of students.

PHPE - Philosophy, Politics, and Economics

PHPE308 Special Topics in Philosophy, Politics, and Economics (3 Credits)
A sustained investigation of a topic at the intersection of philosophy, politics and economics.
Repeatable to: 15 credits if content differs.

PHPE308Y Ancient Greek and Roman Philosophy (3 Credits)
A study of the origins and development of philosophy in ancient Greece and Rome, focusing on Socrates, Plato, Aristotle, the Epicureans, and Stoics.
Prerequisite: Must have completed 6 credits in philosophy or classics.
Cross-listed with: PHIL310, CLAS310.
Credit Only Granted for: PHIL310, CLAS310, or PHPE308Y.

PHPE313 From the Stoa to Silicon Valley: Ancient and Modern Approaches to Stoic Philosophy (3 Credits)
Stoicism, ancient Rome's most popular philosophy, posited that virtue is the only human good and that individuals must detach themselves emotionally from the material world in order to live ethical lives. Principles of Stoic philosophy will be explored together with the wide array of artistic, political, and intellectual traditions that have drawn inspiration from it, from the Haitian revolutionary movement of the late 18th century, to the sexist "manosphere" of Reddit and Twitter, to modern cognitive-behavioral therapy.
Cross-listed with: CLAS313, PHIL313.
Credit Only Granted for: CLAS313, PHIL313, or PHPE313.

PHPE350 Careers in Impact (3 Credits)
The impact ecosystem is vast and complex and consists of public, private, and nonprofit sectors engaged in shaping the world around them. Each sector within this ecosystem has its own theory of change and plays a specific role in the broader impact space. As you seek to become a purposeful professional, it is essential to develop a deeper understanding of this ecosystem, the different levers of influence within it, and the intra-relationship between the sectors. This course introduces you to both the impact landscape and working professionals. Through lectures, guest visits, and hands-on projects you come away better equipped to find your place within the impact ecosystem.

PHPE355 Practicum on Civic Engagement (3 Credits)
As a PPE student, you are motivated to shape the world around you. Local governments share this same mission. In "Practicum on Civic Engagement", you will learn the tools of civic engagement and develop a project for a local government that furthers their goals. The class will consist of lectures that cover political, economic, and cultural aspects of civic engagement along with discussion days where you will work with your colleagues on a real-world project. This course is not an internship. Students will work to develop a project to serve their local government over the course of the semester and will have an opportunity to present their work to local government officials at the end of the semester.

PHPE386 Experiential Learning Practicum in Philosophy, Politics, and Economics (3-6 Credits)
For students who wish to gain experience working in research outside the classroom. Pending approval of the department, students may work at a professional site or remotely under professional supervision - your primary supervisor must be a professional in the field. Beyond working at a professional site or under professional supervision, students will have to complete further assignments to receive a passing grade in the course. Students may take PHPE386 for three-six credits, but only three credits will count towards the major requirements. PHPE386 is only open to those with junior standing or above.
Restriction: Junior standing or higher.

PHPE400 Individual and Group Decision-Making (3 Credits)
Foundational issues that arise within the theories of rational choice that underlie the treatments of decision-making found in economics, politics, and the other social sciences. The course is focused on individual decisions (rational choice theory), strategic decisions (game theory) and group decisions (social choice theory). In addition to presenting the formal models of decision making, we also discuss to what extent these mathematical theories explain social interactions. An important aspect of the course is to introduce students to the ways in which economic analysis has been applied to issues in social and political philosophy. Readings will be drawn from the literature in economics, psychology, statistics and political science, as well as philosophy.
Restriction: Must be in the Philosophy, Politics and Economics major; and must have junior standing or higher; or permission of instructor .

PHPE401 Social Philosophy and Political Economy (3 Credits)
Examines capitalism and socialism as differing modes of economic production through several different theoretical lenses. We begin by examining capitalism and socialism as they developed historically, by looking primarily at the work of Adam Smith and Karl Marx. Then, we turn our attention to one of the most important debates in 20th century economics: to what extent rational economic calculation is possible in a socialist commonwealth. After this we turn our attention to how capitalist and socialist modes of production functioned in practice. We end by turning our attention to the ethics of capitalism and socialism: which mode of economic production is most just?
Restriction: Must be in the Philosophy, Politics and Economics major; and must have junior standing or higher; or permission of instructor.

PHPE402 Senior Capstone in Philosophy, Politics, and Economics (3 Credits)
Senior capstone course for the Philosophy, Politics, and Economics major. The exact content of the course will be determined by the instructor who teaches it. The purpose of the course is to pursue sustained inquiry on a narrow philosophical topic, using the tools and methods from economics and political science to help analyze the topic. The course ends with a substantial research paper, where the student should demonstrate an ability to use the tools of philosophy, political science, and economics in his or her analysis.
Restriction: Must be a PHPE (Philosophy, Politics & Economics) major with senior standing; or permission of instructor.

PHPE408 Advanced Topics in Philosophy, Politics, and Economics (3 Credits)
A sustained investigation of a topic at the intersection of philosophy, politics and economics.
Repeatable to: 15 credits if content differs.

PHPX - Philosophy, Politics, and Economics Education Abroad

PHPX300 Facts and Fictions of Climate Change (3 Credits)
Explores theories of knowledge about climate change and how humans attempt to know, experience, and express the phenomenon of climate change. Examines on how "fact" is constructed by cultures in relation to climate change with a particular focus on air conditions and their representation in contemporary China.
Additional Information: This course is offered as part of the Arts & Humanities-in-London study abroad program. Students must apply for this program through Education Abroad: More information at https://globalmaryland.umd.edu/offices/education-abroad/program/11854. Education Abroad processes registrations for this course on behalf of students.

PHPX302 Human Rights in History: Origins, Foundations, Prospects (3 Credits)
What are human rights and where do they come from? In this class students will examine the tangled origins of the concept of human rights, its relation to broader transformations of moral conscience, how it became institutionalized in law and modern world politics, and why its history and prospects have become so fiercely contested today. Students will focus on cases from European, imperial, American and global history that illuminate how human rights became part of the contemporary framework of politics, law, culture, and historiography.
Additional Information: This course is offered as part of the Arts & Humanities-in-London study abroad program. Students must apply for this program through Education Abroad: More information at https://globalmaryland.umd.edu/offices/education-abroad/program/11854. Education Abroad processes registrations for this course on behalf of students.

PHPX303 History of Political Thought (6 Credits)
Explores key questions in the development of the concept of democracy through the study of texts by some of the most important thinkers and debates in the history of political thought, beginning in the ancient world and continuing through the twentieth century. Students will look at arguments and controversies as they unfolded in different historical circumstances, becoming familiar with the concepts, problems, and debates that have shaped political thought.
Additional Information: This course is offered as part of the Arts & Humanities-in-London study abroad program. Students must apply for this program through Education Abroad: More information at https://globalmaryland.umd.edu/offices/education-abroad/program/11854. Education Abroad processes registrations for this course on behalf of students. Please note that this course spans two semesters.

PHPX304 Modernity: Theories of State, Economy and Society (6 Credits)
Reflects on the concept of modernity through the examination of theories of society, economy and the state, and how modernity's promises of liberty, equality, and fraternity have been compromised from the outset. Students will study key theorists and moments in the history of modernity, and consider the dark side of modernity and critiques from both the "left" and the "right", the "culture of modernity", and the distinction between modernity and progress in history.
Additional Information: This course is offered as part of the Arts & Humanities-in-London study abroad program. Students must apply for this program through Education Abroad: More information at https://globalmaryland.umd.edu/offices/education-abroad/program/11854. Education Abroad processes registrations for this course on behalf of students. Please note that this course spans two semesters.

PHPX305 Socialist Political Thought (3 Credits)
Explores how socialism has historically provided the most important ideological and political alternative to capitalism and liberalism. This course examines core ideas in the history of socialist thought through a close reading of selected primary texts and the exploration of themes such as utopia, community, class, ownership and control, culture and identity, equality, and democracy.
Additional Information: This course is offered as part of the Arts & Humanities-in-London study abroad program. Students must apply for this program through Education Abroad: More information at https://globalmaryland.umd.edu/offices/education-abroad/program/11854. Education Abroad processes registrations for this course on behalf of students.

PHSC - Public Health Science

PHSC201 The Pursuit of Career Success in Public Health Science (1 Credit)
Explore the dynamic connection between experiential learning and career readiness in the field of public health by engaging with insightful podcasts that bring real-world perspectives to the forefront. Through active learning, you will evaluate your skill set, reflect on your experiences, analyze industry trends, and uncover best practices essential for success in the public health workforce. This course is designed to help you bridge the gap between your current abilities and your career aspirations. By strategically planning your curricular and co-curricular engagement, you'll develop a roadmap tailored to your unique goals. This personalized action plan will empower you to navigate your career path moving fearlessly forward.
Restriction: Must be in the Public Health Science program.
Credit Only Granted for: PHSC388D or PHSC201.
Formerly: PHSC388D.

PHSC300 Foundations of Public Health (3 Credits)
An overview of the goals, functions, and methods of public health. After an introduction to the core concepts and tools used in public health research and practice, applications of these methodologies are considered in the context of current controversies/problems in public health. Students work together to develop strategies for prevention and control that take into consideration different points of view, outside research, and impacts on individuals and communities.
Restriction: Must be a major within the School of Public Health.
Credit Only Granted for: SPHL100 or PHSC300.

PHSC321 Transfer Success for the Public Health Science Major (3 Credits)
A public health-focused transition course for first year transfer students in UMD's PHSC program at Shady Grove. Students will engage with current public health topics through primary sources, literature reviews, course discussions, analytic writing, and critical thinking. Academic success and professional development in the public health field will be emphasized. Students will also engage with faculty, staff, centers, and resources both at the University of Maryland, College Park and the Universities at Shady Grove.
Restriction: Must be a first year transfer student in UMD's Public Health Science program at Shady Grove.

PHSC388 Special Topics in Public Health Science (1-3 Credits)
Will differ by specific course offering.
Restriction: Must be in Public Health Science program; and must have earned a minimum of 45 credits.
Repeatable to: 9 credits if content differs.

PHSC389 Independent Research Study in Public Health Science (1-6 Credits)
This independent research-based experience will provide the opportunity for students to work with individual research mentors in the area of Public Health Science. Students must identify a mentor prior to obtaining departmental permission.
Restriction: Must be in Public Health Science program; and must have earned a minimum of 45 credits; and permission of instructor.
Repeatable to: 6 credits if content differs.

PHSC399 Public Health Science Internship (1-6 Credits)
The Public Health Science internship will enable students to gain practical experience under conditions conducive to academic, research and professional development. The internship is a time-limited, supervised period of public health professional experience carried out in a related professional organization or research setting.
Restriction: Must be in Public Health Science program; and must have completed a minimum of 75 credits; and must have permission of instructor.
Repeatable to: 6 credits if content differs.
Credit Only Granted for: PHSC491 or SPHL491.
Formerly: SPHL491.
Additional Information: Prospective students must meet with an advisor and complete internship verification, expectations and responsibilities prior to registration. This is generally completed the semester prior to beginning the internship.

PHSC401 History of Public Health (3 Credits)
Emphasis is on the history of public health in the Western world from antiquity to the present. Also examines the influence of public health developments as they relate to the Western world as well as throughout diverse cultures and societies across the globe. Analysis focuses on the interaction among Western and non-Western cultures with respect to health issues, including science, policies, prevention and treatment.
Restriction: Must be in Public Health Science program; and must have earned a minimum of 45 credits.
Credit Only Granted for: PHSC401 or SPHL401.
Formerly: SPHL401.

PHSC405 Policy Advocacy and Public Health (3 Credits)
Students will identify and analyze policy solutions to public health problems and determine advocacy strategies to encourage policy makers to implement the recommendations. Lectures, class discussions, group work and mock advocacy exercises will integrate the principles and practice of public health advocacy. Guest lecturers from a variety of settings will give students a broad range of perspectives and advocacy experiences.
Prerequisite: Minimum grade of C- in HLSA300.
Restriction: Must be in Public Health Science program; and must have earned a minimum of 60 credits.

PHSC410 Public Health Program Planning and Evaluation (3 Credits)
Students will become familiar with the dynamics of public health program planning, and the basic process of identifying unmet needs. They will be able to identify different types of program evaluation, including needs assessment, formative research, process evaluation, impact assessment, and cost analysis.
Restriction: Must be in Public Health Science program; and junior standing or higher.
Credit Only Granted for: PHSC410 or SPHL410.
Formerly: SPHL410.

PHSC412 Food, Policy, and Public Health (3 Credits)
Broad overview of the impact of food and food policy on public health. Course covers topics such as access to food, food systems, influence of food policies on the individual, the cost of food, influences on food selection, food safety risks and responses, nutrition-related health challenges, and a comparison of US food/nutrition issues with those of other nations.
Prerequisite: Must have completed HLSA300 with a C- or higher.
Recommended: NFSC100.
Restriction: Must be in Public Health Science program; and junior standing or higher.
Credit Only Granted for: PHSC412 or SPHL412.
Formerly: SPHL412.

PHSC415 Essentials of Public Health Biology: The Cell, The Individual, and Disease (3 Credits)
Presents the basic scientific and biomedical concepts of modern public health problems and explores in depth mechanisms and models of the major categories of disease. The biologic principles presented are foundations to public health disease prevention, control, or management programs.
Prerequisite: Minimum grade of C- in BSCI202.
Recommended: BSCI223.
Restriction: Must be in Public Health Science program; and junior standing or higher.
Credit Only Granted for: PHSC415, SPHL415 or SPHL498J.
Formerly: SPHL415 and SPHL498J.

PHSC420 Vaccines and Immunology (3 Credits)
An exploration of immunology and vaccines through a public health lens. We will examine the cells, systems, and molecules that comprise the human immune system and defend your body against disease. In addition, we will discuss the strategies used during vaccine development including the history and future of vaccination and how increased understanding of the immune system has allowed scientists to improve and refine the process. Finally we will examine the current social and political situation surrounding vaccination and the roles and responsibility of public health practitioners.
Prerequisite: Minimum grade of C- in BSCI202.
Recommended: CHEM231.
Restriction: Must have earned a minimum of 60 credits. And must be in Public Health Science program; or permission of instructor.

PHSC425 Genetics, Genomics, and Public Health (3 Credits)
Recent advances in genomic science and biomedical technologies have increased our understanding of the genetic basis of disease and the interplay between genetics and environmental and behavioral factors. This course will provide a solid background in basic genetics and genomic science and highlight the role of public health professionals in translating breakthroughs in this rapidly transforming field into the clinical setting, program planning, and policy. Topics covered will include the molecular basis for genetic variation, fetal and newborn screening, genetic risk factors for cancer, pharmacogenetics, the role of pathogen genomics in outbreak investigation, and applications of genetic engineering in solving public health issues.
Prerequisite: Must have completed BSCI170 and 171 with a C- or higher.
Recommended: BSCI222 and BSCI223.
Restriction: Must have earned a minimum of 60 credits; and must be in Public Health Science program.
Credit Only Granted for: SPHL498X OR PHSC425.
Formerly: SPHL498X.

PHSC426 Climate Change and Health (3 Credits)
Climate changes pose significant risks to population health by affecting air quality, the availability of safe drinking water, infectious disease transmission, food security, and access to housing, land, and livelihoods. Students examine the relationship between climate change and human health, focusing on how climate change vulnerability varies between populations by geographic, demographic, and socioeconomic characteristics.
Prerequisite: Minimum grade of C- in MIEH300.
Restriction: Must be in Public Health Science program.

PHSC430 Public Health in the City: Perspectives on Health in the Urban Environment (3 Credits)
Exposure to issues related to city habitation and the health of the public, including how the urban environment impacts the lives and health of city dwellers, including discussion of the social determinants of health. Students are encouraged to think about urban health and policy, and to question the current state of urban public health. Issues of race, class, and equality will be discussed throughout the course as they relate to each of these topics.
Prerequisite: Minimum grade of C- in BSCI202 and MIEH300.
Restriction: Must be in Public Health Science program; and junior standing or higher.
Credit Only Granted for: PHSC430 or SPHL498G.
Formerly: SPHL498G.

PHSC440 Public Health Nutrition (3 Credits)
Engages students in conceptual thinking about the relationship between public health and nutritional health. Students will analyze and interpret "A Framework for Public Health Nutrition." Students will identify determinants of nutritional health, assess nutritional health in individuals and populations, develop strategies to mitigate these issues, and analyze and evaluate public health nutrition policies.
Prerequisite: A minimum of C- in BSCI170, BSCI171, CHEM131, CHEM132 and EPIB301.
Restriction: Must be in Public Health Science program.
Credit Only Granted for: PHSC440 or NFSC498L.

PHSC450 Addressing Social and Structural Inequities Through Public Health (3 Credits)
A focus on addressing social and structural inequities within race, gender, disability, and class through various perspectives in the field of public health. Students explore the causes, challenges, consequences, and extent these injustices have on health disparities from local, national, and global perspectives. Students view these inequities through the lens of the affected populations, and work interactively and collaboratively to interpret, design, and evaluate public health interventions and approaches to address key health disparities within specific communities. The aim of this course is to help students define appropriate research and address structural inequities with innovative approaches through the professional practice of public health.
Prerequisite: Minimum grade of C- in MIEH300; and 1 course with a minimum grade of C- from either SPHL100 or PHSC300.

PHSC490 Public Health in Action: Applied Health Solutions (3 Credits)
Engage in hands-on public health problem-solving by partnering with organizations tackling real-world health challenges. Students will collaborate to design culturally responsive, evidence-based interventions. Gain valuable skills in health consulting, communication, and teamwork while making a measurable impact on public health.
Prerequisite: Minimum grade of C- or in SPHL100 and HLTH366.
Restriction: Must be a Public Health Science major; and must have a minimum of 60 credits.
Credit Only Granted for: PHSC388G or PHSC490.
Formerly: PHSC388G.

PHSC497 Public Health Science Capstone (3 Credits)
The capstone course is the culminating experience for Public Health Science students and must be taken only in the final semester of study. The Public Health Science capstone course is designed to challenge students to integrate the five core areas of public health in investigating, researching and addressing public health issues. Throughout the semester, students will be required to evaluate, analyze and synthesize scholarly works as they research and propose solutions to a variety of public health issues. By the conclusion of this research based course, students will understand how the various public health perspectives can combine in addressing and informing public health practices.
Prerequisite: Must have completed the professional writing requirement with a C- or higher; and minimum grade of C- in PHSC450.
Restriction: Must have earned a minimum of 100 credits; and must be in Public Health Science program; and must be in the final semester of undergraduate study.
Credit Only Granted for: SPHL498F or PHSC497.
Formerly: SPHL498F.

PHYS - Physics

PHYS102 Physics of Music (3 Credits)
A study of the physical basis of sound, acoustical properties of sound, the human ear and voice, reproduction of sound, electronic music, acoustical properties of auditoriums, and other selected topics.
Prerequisite: Must have math eligibility of MATH107 or higher.
Credit Only Granted for: PHYS102 and PHYS499C.
Additional Information: CORE Distributive Studies Physical Sciences Laboratory Course only when taken concurrently with PHYS103.

PHYS103 Physics of Music Laboratory (1 Credit)
Optional laboratory to accompany PHYS 102. Laboratory experiments, including the velocity of sound, sound quality and wave shape, traveling and standing waves, fourier synthesis and analysis, musical synthesizer, psychoacoustics, and audio equipment.

PHYS105 A Global Challenge: Energy and Climate Change (3 Credits)
How will the world address the energy needs of a growing population and its impact on climate change? This class will explore potential solutions to mitigate our atmospheric impact, including technological innovations and policy measures. Additionally, we will analyze the roles of economics, government, and industry in shaping our responses within the context of modern science.
Additional Information: This course is aimed at the non-science major.

PHYS106 Light, Perception, Photography, and Visual Phenomena (3 Credits)
Intended for the general student, this course will cover topics in optics which require minimal use of mathematics. Principles of optics, lenses, cameras, lasers and holography, physics of the eye, color vision and various visual phenomena such as rainbows.

PHYS107 Light, Perception, Photography and Visual Phenomena Laboratory (1 Credit)
Optional laboratory to accompany PHYS106. Laboratory experiments include geometrical optics (lenses, cameras, eye), optical instruments (telescope, binoculars), photography, perception, color phenomena, and wave phenomena.

PHYS111 Physics in the Modern World (3 Credits)
A survey course in general physics emphasizing the role that physics plays in science, technology, and society today. The course is concept oriented and minimal use of mathematics is made. Intended for the general student; does not satisfy the requirements of the professional schools.

PHYS115 Inquiry into Physics (4 Credits)
Intended for students majoring in neither the physical nor the biological sciences. Use of laboratory-based and inquiry-based methods to study some of the basic ideas of physical sciences.
Recommended: High School Physics.
Restriction: Must not have completed PHYS117; and must be in one of the following programs (Elementary Education; Early Childhood Education; Middle School Education).
Credit Only Granted for: PHYS115 or PHYS117.

PHYS121 Fundamentals of Physics I (4 Credits)
The first part of a two-semester course in general physics treating the fields of mechanics, heat, sound, electricity, magnetism, optics, and modern physics. Together with PHYS122, this generally satisfies the minimum requirement of medical and dental schools.
Prerequisite: MATH113 or MATH115.
Credit Only Granted for: PHYS121, PHYS131, or PHYS331.

PHYS122 Fundamentals of Physics II (4 Credits)
A continuation of PHYS121, which together with it, generally satisfies the minimum requirement of medical and dental schools.
Prerequisite: PHYS121; or students who have taken courses with comparable content may contact the department.
Credit Only Granted for: PHYS122, PHYS132, or PHYS332.

PHYS131 Fundamentals of Physics for Life Sciences I (4 Credits)
The first part of a two-semester course in general physics specifically oriented towards applications relevant for students in biology and pre-medical programs. The course covers basic mechanics including forces and energy, properties of matter, and thermodynamics done in authentic biological contexts.
Prerequisite: CHEM131; and (MATH136 or MATH140); and (BSCI160 and BSCI161; or BSCI106); and (BSCI170 and BSCI171; or BSCI105).
Credit Only Granted for: PHYS121, PHYS131, or PHYS331.

PHYS132 Fundamentals of Physics for Life Sciences II (4 Credits)
The second part of a two-semester course in general physics specifically oriented towards applications relevant for students in biology and pre-medical programs. The course covers basic statistical physics, electricity and magnetism, and optics done in authentic biological contexts.
Prerequisite: PHYS131; or students who have taken courses with comparable content may contact the department.
Credit Only Granted for: PHYS122, PHYS132, or PHYS332.

PHYS141 Principles of Physics (4 Credits)
The first of a two-semester series in general physics. The first semester covers the fields of mechanics, thermodynamics, and special relativity. This survey course will use calculus and is recommended for chemistry and zoology majors. It also satisfies the requirements of medical and dental schools.
Corequisite: MATH141 or MATH121; or MATH221.
Credit Only Granted for: PHYS141, PHYS161, or PHYS171.

PHYS142 Principles of Physics (4 Credits)
A continuation of PHYS141 covering waves, electricity and magnetism, optics and modern physics.
Prerequisite: PHYS141; or students who have taken courses with comparable content may contact the department.
Credit Only Granted for: PHYS142, (PHYS260 and PHYS261), or PHYS272.

PHYS161 General Physics: Mechanics and Particle Dynamics (3 Credits)
First semester of a three-semester calculus-based general physics course. Laws of motion, force, and energy; principles of mechanics, collisions, linear momentum, rotation, and gravitation.
Prerequisite: Must have completed or be concurrently enrolled in MATH141.
Credit Only Granted for: PHYS141, PHYS161, or PHYS171.
Additional Information: General Education Natural Sciences Lab (DSNL) Course only when taken concurrently with PHYS275.

PHYS165 Introduction to Programming in the Physical Sciences (3 Credits)
Introduction to programming using examples in the physical sciences. Provides instruction in the techniques of upper-level languages such as Fortran, C, and Pascal, as well as an introduction to the object oriented programming techniques used in Python, C++ and Java. Includes strong component of visualization and graphing.
Prerequisite: PHYS171, PHYS141, or PHYS161; or must have scored 3 or higher on AP PHYS exam.

PHYS170 Professional Physics Seminar (1 Credit)
Provides a look at some of the major developments of current interest in physics research and discusses the activities physicists undertake in research, education, industry, government, and other areas of the economy.
Corequisite: MATH140.
Restriction: Must be in Physics program; or must be in Physics-Education program; or permission of instructor.

PHYS171 Introductory Physics: Mechanics (3 Credits)
First semester of calculus-based physics. Kinematics, Newton's laws, energy and work, linear and angular momenta, rotational motion, universal gravitation, and mechanical applications.
Prerequisite: MATH140; or permission of CMNS-Physics department.
Credit Only Granted for: PHYS141, PHYS161, or PHYS171.
Additional Information: Intended primarily for physics and astronomy majors. General Education Natural Sciences Lab (DSNL) Course only when taken concurrently with PHYS275.

PHYS172 Succeeding in Physics: Applications, Resources and Concepts (1 Credit)
Supplemental instruction and support for students taking PHYS171, especially for students with limited high school physics preparation, or who will benefit from extra review and practice of relevant mathematics and physics concepts and skills.
Corequisite: PHYS171.
Restriction: Permission of CMNS-Physics department.

PHYS174 Physics Laboratory Introduction (1 Credit)
Introduces students to the techniques of data gathering and analysis. This course will lay a foundation for higher-level labs in physics and the physical sciences. Students will learn to use laboratory equipment such as calipers, meters, oscilloscopes, and computer interfaces. Techniques of measurement and error analysis will be presented. Students will be taught to use the computer for data analysis with an emphasis on using spreadsheets.
Corequisite: MATH140.
Recommended: High school physics.

PHYS235 The Manhattan Project (3 Credits)
Introduction to some critical ideas of nuclear physics and a review of some key historical developments starting at the end of the 19th century. Chronological development of nuclear physics from the discovery of radioactivity by Becquerel in 1896 through to the discovery of fission in Germany in 1938 followed by an examination of the programs to develop nuclear weapons in the United States, Britain and Germany. Extensive study of political, ethical, scientific, military, social, and economic issues surrounding the Manhattan Project.
Recommended: Students should be comfortable standard high school algebra II.
Credit Only Granted for: PHYS199M or PHYS235.
Formerly: PHYS199M.

PHYS260 General Physics: Electricity, Magnetism and Thermodynamics (3 Credits)
Second semester of a three-semester calculus-based general physics course. Electrostatics, magnetism, induction, DC and AC circuits; Maxwell's Equations, heat, and thermodynamics.
Prerequisite: PHYS161 and MATH141.
Corequisite: PHYS261.
Credit Only Granted for: PHYS142, PHYS260, or PHYS272.

PHYS261 General Physics: Mechanics, Vibrations, Waves, Heat (Laboratory) (1 Credit)
Lab includes experiments on mechanics, vibrations, waves, and heat. Engineering majors are expected to take PHYS260 and PHYS261 in the same semester.
Prerequisite: PHYS161.

PHYS265 Introduction to Scientific Programming (3 Credits)
Introduction to scientific programming with python. Basic data types, sequences, input/output, and program control flow structures. Evaluation and plotting of mathematical functions and data. Statistical interpretation of data, and fitting of data to models. Introduction to numerical methods including integration, solutions of ordinary differential equations, and linear algebra. Extensive use of the numpy, matplotlib, and scipy packages.
Prerequisite: PHYS171, PHYS141, or PHYS161; or must have scored 3 or higher on AP PHYS C Mechanics exam.
Credit Only Granted for: PHYS165 or PHYS265.
Formerly: PHYS165.

PHYS270 General Physics: Waves, Optics, Relativity and Modern Physics (3 Credits)
Third semester of a three-semester calculus-based general physics course. Waves, sound, electromagnetic waves, optics, special theory of relativity, and modern physics.
Prerequisite: PHYS261, MATH241, and PHYS260.
Corequisite: PHYS271.

PHYS271 General Physics: Electrodynamics, Light, Relativity and Modern Physics (Laboratory) (1 Credit)
Lab includes experiments on ac circuits, magnetism, light and modern physics. PHYS270 and PHYS271 (lab) must be taken in the same semester.
Prerequisite: PHYS261.
Corequisite: PHYS270.

PHYS272 Introductory Physics: Electricity and Magnetism (3 Credits)
Second semester of calculus-based introductory physics. Electric and magnetic fields and potentials; simple circuits; Maxwell's equations in integral form. Continues the application of mathematics to conceptual models, now with more abstract components.
Prerequisite: PHYS161 or PHYS171; and MATH141; and must have completed or be concurrently enrolled in MATH241.
Credit Only Granted for: PHYS142, PHYS260, or PHYS272.
Additional Information: Intended primarily for physics and astronomy majors.

PHYS273 Intermediate Oscillations and Waves (3 Credits)
Classical physics at an intermediate level, introducing mathematical tools such as complex variables, linear differential equations, and Fourier series and transforms. Physics of mechanical and electrical oscillators, including damped and driven systems; coupled oscillators and normal modes; the classical wave equation and its Fourier solutions; wave reflection and transmission at boundaries; Maxwell's equations in differential form; electromagnetic waves, and physical optics.
Prerequisite: MATH241 and PHYS272; and must have completed or be concurrently enrolled in one of the following: (PHYS274, MATH243, MATH246 or equivalent).

PHYS274 Mathematical Methods for Physics I (3 Credits)
A first course in mathematical methods for physics. Topics include linear algebra, curvilinear coordinates and vector analysis.
Prerequisite: MATH241 and PHYS272.

PHYS275 Experimental Physics I: Mechanics and Waves (2 Credits)
A first course for physics majors and interested engineering students introducing the methods of experimental science. Students learn to identify various statistical data distributions, carry out rigorous uncertainty analysis, and test whether a given theoretical model adequately describes the observed phenomena. These concepts are applied to sophisticated physical systems that exhibit complex behavior and can yield remarkably precise and accurate results. Experiments are chosen from the areas of mechanics and waves.
Prerequisite: Must have completed or be concurrently enrolled in PHYS171 or PHYS161.
Additional Information: General Education Natural Sciences Lab (DSNL) Course only when taken concurrently with PHYS171 or PHYS161.

PHYS276 Experimental Physics II: Analog Circuits (2 Credits)
A second course in experimental physics. Investigation of the behavior of analog circuits through applications in AM radio technology. The course includes an introduction to electronic test instrumentation and associated measurement uncertainties
Prerequisite: PHYS272 and PHYS275.

PHYS298 Special Topics in Physics (1-3 Credits)
Special topics in physics.
Repeatable to: 6 credits if content differs.

PHYS299 Special Problems in Physics (1-6 Credits)
Research or special study to complement courses taken elsewhere which are not fully equivalent to those in departmental requirements. Credit according to work done.
Prerequisite: Permission of CMNS-Physics department.

PHYS299Q Quantum Steampunk Science-Fiction Workshop (3 Credits)
Steampunk is a science-fiction genre in which futuristic technologies populate Victorian-era settings. Recently, steampunk has come to life in the scientific field of quantum thermodynamics. Thermodynamics, the study of energy, grew out of the Industrial Revolution. Two centuries later, quantum physics is transforming computing and cryptography. Quantum science is now revolutionizing 19th-century thermodynamics in quantum thermodynamics, which features quantum engines, automata, and more. Quantum thermodynamics inspired the growing subgenre of quantum steampunk. In this course, you will read science fiction, write quantum steampunk short stories, receive feedback, and critique classmates' writing. In parallel, you will learn about quantum physics, technologies, and thermodynamics.
Cross-listed with: ARHU270, CHEM298Q, CMSC298Q, ENME299Q.
Credit Only Granted for: ARHU270, ARHU298Q, CHEM298Q, CMSC298Q, ENME299Q or PHYS299Q.

PHYS313 Electricity and Magnetism I (4 Credits)
A first course in electricity and magnetism at an advanced level. Electrostatics; solutions to the Laplace and Poisson equations in cartesian and spherical coordinates; electric fields in matter; and magnetostatics. Study of boundary value problems and extensive use of vector calculus.
Prerequisite: MATH241, PHYS273, and one of the following: PHYS274, MATH240, MATH243, MATH246, or equivalent courses.

PHYS318 Topics in Contemporary Physics (3 Credits)
A survey of topics of current research and public interest. Intended for the non-physics or non-science major. Topics covered will include lasers, quantum liquids, cosmology, elementary particles and geophysics.
Prerequisite: PHYS122 or PHYS111; or permission of CMNS-Physics department.

PHYS331 Physics for Life Sciences I (4 Credits)
The first part of a two-semester course in general physics specifically oriented towards applications relevant for students in biology and pre-medical programs. The course covers basic mechanics including forces and energy, properties of matter, and thermodynamics done in authentic biological contexts.
Prerequisite: CHEM131; and (MATH131 or MATH136); and (BSCI160 and BSCI161; or BSCI106); and (BSCI170 and BSCI171; or BSCI105). Or students who have taken courses with comparable content may contact the department.
Credit Only Granted for: PHYS121, PHYS131 or PHYS 331.

PHYS332 Physics for Life Sciences II (4 Credits)
The second part of a two-semester course in general physics specifically oriented towards applications relevant for students in biology and pre-medical programs. The course covers basic statistical physics, electricity and magnetism, and optics done in authentic biological contexts.
Prerequisite: PHYS331; or PHYS131; or students who have taken courses with comparable content may contact the department.
Credit Only Granted for: PHYS122, PHYS132, or PHYS332.

PHYS371 Modern Physics (3 Credits)
Physics of the early 20th century. Special relativity; particle-wave duality; Compton scattering; the Bohr model; the Schroedinger equation; atomic and nuclear physics phenomena. Includes introductory thermodynamics and the kinetic theory of gases.
Prerequisite: PHYS273; and 1 course from (PHYS274, MATH243, or MATH246).
Credit Only Granted for: PHYS371 or PHYS420.
Additional Information: Intended primarily for physics and astronomy majors.

PHYS373 Mathematical Methods for Physics II (3 Credits)
A second course in mathematical methods for physics. Topics include introduction to ordinary differential equations, partial differential equations, and complex analysis.
Prerequisite: PHYS273 and PHYS274.

PHYS375 Experimental Physics III: Experimental Optics (3 Credits)
A third course in experimental physics. Gaussian beams, geometric optics, polarization phenomena, and physical optics.
Prerequisite: PHYS273, PHYS276, and (PHYS265, CMSC106, CMSC131, or another acceptable computer programming course with approval from the Physics Department).

PHYS386 Experiential Learning (3-6 Credits)

PHYS389 Undergraduate Thesis Research (1-6 Credits)
Independent directed research and study on a topic selected by the student in consultation with his or her advisor. Final written thesis and oral defense will be expected.
Prerequisite: Permission of CMNS-Physics department.
Restriction: Must be in a major within CMNS-Physics department.
Repeatable to: 6 credits.

PHYS398 Independent Studies Seminar (1-16 Credits)
Credit according to work done. Enrollment is limited to students admitted to the independent studies program in physics.

PHYS399 Special Problems in Physics (1-3 Credits)
Selected advanced experiments. (Will be given with sufficient demand.)
Prerequisite: PHYS405; and permission of CMNS-Physics department.

PHYS401 Quantum Physics I (4 Credits)
The first of a two-semester survey of quantum mechanics, employing the formalism of Dirac notation, linear operators, and Hilbert spaces. Quantum state preparation and measurement, the Schroedinger equation in both its matrix and wave descriptions, and applications to systems such as the harmonic oscillator and the hydrogen atom.
Prerequisite: PHYS265 and PHYS371; and 1 course from (PHYS313, PHYS373, or MATH462).
Additional Information: Intended primarily for Physics and Astronomy majors.

PHYS402 Quantum Physics II (3 Credits)
Applications of quantum mechanics to atomic, molecular, and solid state systems. Addition of angular momenta, multiparticle states, perturbation theory and other approximation techniques, scattering, and symmetries.
Prerequisite: PHYS401.

PHYS404 Introduction to Statistical Thermodynamics (3 Credits)
Introduction to basic concepts in thermodynamics and statistical mechanics.
Prerequisite: PHYS371 or PHYS420.

PHYS405 Advanced Experiments (3 Credits)
Advanced laboratory techniques. Selected experiments from many fields of modern physics. Emphasis on self-study of the phenomena, data analysis, and presentation in report form.
Prerequisite: PHYS375.
Restriction: Must be in a major within CMNS-Physics department.

PHYS406 Experimental Research Development (3 Credits)
Part I of a two-semester, independent, experimental research project supervised by a faculty mentor. The student participates significantly in experimental design, set-up, and collection and analysis of real, physical data, including the evaluation of experimental uncertainties. The student maintains a lab notebook and completes an end-of-semester progress report.
Prerequisite: PHYS375.
Restriction: Permsission of CMNS-Physics department.
Additional Information: The student is expected to work on the project for approximately 9 hours per week in a standard semester or a total of 135 hours in a non-standard semester. PHYS406 may not be used to satisfy an advanced physics elective.

PHYS407 Undergraduate Experimental Research (3 Credits)
Students develop and complete an independent, experimental research project with a professor in the Physics Department. The project should be a continuation of work done in PHYS406. To obtain permission, students must submit a proposal describing the experimental work to be completed and this proposal must be approved by their faculty mentor, the associate chair for undergraduate education and the chair of the laboratory committee. Students must maintain a lab notebook, give an oral presentation and complete a written report on their research that includes data and error analysis.
Prerequisite: PHYS406; and permission of CMNS-Physics department.
Restriction: Must be in a major within CMNS-Physics department; and senior standing.

PHYS410 Classical Mechanics (3 Credits)
Classical mechanics at a more advanced level, including its Newtonian, Lagrangian, and Hamiltonian formulations. Conservative and non-conservative forces; the calculus of variations; central force motion; non-inertial frames of reference; rigid body rotations; and selected advanced topics.
Prerequisite: PHYS265 and PHYS273; and (MATH243 or MATH246).

PHYS411 Intermediate Electricity and Magnetism (4 Credits)
Foundations of electromagnetic theory, with extensive applications of the methods. Thorough treatment of wave properties of solutions of Maxwell's equations.
Prerequisite: PHYS313 or PHYS373.

PHYS412 Intermediate Electricity and Magnetism I (4 Credits)
The first semester of a two semester course with emphasis on electrostatics and magnetostatics, boundary value problems, fields in matter, electrodynamics, and Maxwell's equations.
Prerequisite: PHYS373.

PHYS413 Electricity and Magnetism II (3 Credits)
The second semester of a two semester course with emphasis on electromagnetic waves, potentials and gauge invariance, and relativistic electrodynamics
Prerequisite: PHYS313 or PHYS412.
Credit Only Granted for: PHYS411 or PHYS413.

PHYS420 Principles of Modern Physics (3 Credits)
A survey of atomic and nuclear phenomena and the main trends in modern physics. Appropriate for students in engineering and other physical sciences.
Prerequisite: MATH246. And PHYS271 and PHYS270; or PHYS273.
Credit Only Granted for: PHYS371 or PHYS420.

PHYS428 Physics Capstone Research (2-4 Credits)
Individual, focused research under the guidance of a faculty member. Discussion, presentations and, if appropriate, research group projects involved. Student must submit final research paper for completion of course. Paper may also serve as thesis required for High Honors in Physics. Not intended as a general "reading course" (see PHYS499).
Restriction: Must be in a major within CMNS-Physics department; and senior standing or higher; and permission of instructor.
Repeatable to: 4 credits.

PHYS429 Atomic and Nuclear Physics Laboratory (3 Credits)
Classical experiments in atomic physics and more sophisticated experiments in current techniques in nuclear physics.
Prerequisite: PHYS405.

PHYS431 Introduction to Solid State Physics (3 Credits)
Classes of materials; introduction to basic ideal and real materials' behavior including mechanical, electrical, thermal, magnetic and optical responses of materials; importance of microstructure in behavior. One application of each property will be discussed in detail.
Prerequisite: PHYS271, PHYS270, and MATH241.
Cross-listed with: ENMA460.
Restriction: Junior standing or higher; and must be in the Engineering: Materials Science program or Physics program.
Credit Only Granted for: ENMA460 or PHYS431.
Additional Information: Materials Engineering students take ENMA460 and Physics students take PHYS431.

PHYS441 Topics in Nuclear and Particle Physics (3 Credits)
A survey of concepts in particle and nuclear physics, with a topical emphasis on the impact of the Weak Interaction and the discovery of Parity Violation.
Prerequisite: PHYS401 or PHYS402.
Corequisite: PHYS402.

PHYS444 Computing Beyond the Standard Model of Particle Physics (3 Credits)
An exploration of the computing languages and techniques used to analyze large data sets in Large Hadron Collider physics with some discussion of applications in unrelated fields.
Prerequisite: PHYS371 and PHYS373; or permission of instructor.

PHYS456 Making Physics Experiments (3 Credits)
Laboratory course emphasizing practical skills used for making Physics experiments within the broader context of the maker movement and the maker culture. Design, fabrication, hands-on skills, repair, and safety. Practical skills not otherwise covered in traditional coursework (e.g.: carpentry, electronics disassembly/assembly, soldering, etc.).
Prerequisite: PHYS276; or permission of instructor.
Restriction: Permission of Physics Department.
Credit Only Granted for: PHYS499X or PHYS456.
Formerly: PHYS499X.

PHYS457 Introduction to Quantum Computing (3 Credits)
An introduction to the concept of a quantum computer, including algorithms that outperform classical computation and methods for performing quantum computation reliably in the presence of noise. As this is a multidisciplinary subject, the course will cover basic concepts in theoretical computer science and physics in addition to introducing core quantum computing topics. No previous background in quantum mechanics is required.
Prerequisite: 1 course with a minimum grade of C- from (ENEE290, MATH240, MATH341, MATH461, MATH243); and 1 course with a minimum grade of C- from (CMSC351, PHYS313).
Cross-listed with: CMSC457.
Credit Only Granted for: CMSC457 or PHYS457.
Additional Information: Only Physics students may use MATH243 to satisfy the Linear Algebra prerequisite for CMSC/PHYS457.

PHYS467 Introduction to Quantum Technology (3 Credits)
Investigates the basic concepts/building blocks of quantum computers, quantum key distribution, quantum networks, and quantum sensors. Examines what is needed to form a working qubit and different hardware platforms that implement them (for example, trapped ions, superconducting microwave circuits, color centers, and neutral atoms.) Conceptual and computational familiarity with complex numbers, vector spaces, bases, matrices, eigenvectors, and eigenvalues will be assumed, as well as quantum states/wave functions, and quantum measurement. Familiarity with spin-1/2 systems, and Pauli matrices is highly recommended.
Prerequisite: MATH141 and MATH240 or equivalent; and one of the following: PHYS360, PHYS401, PHYS457, CMSC457, or ENEE491; or permission of instructor.
Cross-listed with: ENEE492.
Credit Only Granted for: PHYS467 or ENEE492.

PHYS474 Computational Physics (3 Credits)
Introduction to computational physics. Overview of some of the most widely used methods of computational physics and computational methods, including data analysis and statistical methods, visualization, numerical solutions of ordinary and partial differential equations (classical equations of motion, Poisson's equation, time independent and time dependent Schrodinger equations) and Monte Carlo simulations. In addition to giving the students a basic working knowledge of these particular techniques, the goal is to make them proficient in scientific computing and programming in general, so that they will be prepared to tackle other computational and data analysis problems that they may encounter in the future. This course will use the programming language Python.
Prerequisite: PHYS373; and (PHYS165, CMSC106, or CMSC131).
Recommended: PHYS401 (strongly recommended).
Additional Information: Students will need a laptop for this course to run specific software; however, arrangements will be made for those who need them. Students will need to load the Python 3 language on your computer, which will be done in the first week of class. The class will use the "Anaconda" environment/distribution, which is available for Mac/Windows/Linux. Contact the department for more information.

PHYS476 Introduction to Applied Machine Learning (3 Credits)
Introduces machine learning techniques that are becoming pertinent in the technology industry. Focus on hands-on work using popular high-level libraries. Students are expected to have a background in functional programming, linear algebra, calculus, and mathematical modeling.
Prerequisite: PHYS165, PHYS274, and PHYS276; or interested students with backgrounds in functional programming, linear algebra and statistics, should contact the instructors to request permission.

PHYS485 Electronic Circuits (3 Credits)
Theory and application to experimental physics of modern semiconductor analog and digital circuits. Emphasis on understanding passive and active elements in practical circuits. Topics span the range from simple transistor circuits to microcomputers.
Prerequisite: PHYS272 and PHYS276.
Restriction: Must be in a major within CMNS-Physics department.

PHYS487 Computerized Instrumentation (3 Credits)
Concentration on computer interfaces to measurement devices. Includes a review of basic electronic circuits and measurement devices. Extensive work with arduinos, making use of a variety of measurement probes. Includes introduction to the C++ programming language, the Segger development environment, and real-time operating systems (RTOS) used in advanced physics experiments.
Prerequisite: PHYS276 or Permission of Instructor.
Restriction: Departmental Permission.

PHYS499 Special Problems in Physics (1-16 Credits)
Research or special study. Credit according to work done.

PLCY - Public Policy

PLCY100 Foundations of Public Policy (3 Credits)
A survey course, focusing on public policy institutions and analytical issues as well as on overview of key public policy problems. Students will be introduced to public policy as a discipline, with a brief overview of the actors and institutions involved in the process, and familiarize themselves with the kinds of problems typically requiring public action. The course will examine these problems from a multijurisdictional and multisectoral perspective. Specific policy areas examined include education policy, health policy, economic and budgetary policy, criminal justice policy, environmental policy, and national and homeland security policy. The course should permit students to have broad foundational exposure to the field that will give them a solid base for more advanced courses.

PLCY101 Great Thinkers on Public Policy (3 Credits)
Great ideas in public policy, such as equality, efficiency, sovereignty, liberty, bureaucracy, democracy and security are explored through the lens of great thinkers. An introduction to the intellectual foundations of public policy, from ancient theories on collective public action through the more contemporary development of public policy as a discipline. This may start as early as the ancient Greek philosophers and their views on public action through contemporary classics of public policy. At the conclusion of the course, students will have read classic works in the field and will master the key themes that have dominated the intellectual debates about public policy over its history. Emphasis will be on the interdisciplinary foundations of public policy, through examining core disciplinary contributions from economics, political science, management, philosophy, and other relevant disciplines.

PLCY200 Introduction to Research Methods for Policy Analysis (3 Credits)
Introduces students to the basic logic, frameworks, concepts, and techniques to conduct research on matters involved in the analysis of public policy problems. Students are exposed to a variety of methods by which researchers explore tradeoffs in and options for policy that inform solutions and the framing of challenges. Along the way, students will engage relevant literature, cases, and episodes that illustrate how different methods and techniques manifest in practice to inform scholarly and policy conversations. Ultimately, the course lays a foundation for future research and policy applications and students emerge from the course able to design a research strategy to address relevant policy questions.
Restriction: Must be in the Public Policy major or Global and Foreign Policy major.

PLCY201 Public Leaders and Active Citizens (3 Credits)
Aims to inspire, teach and engage students in the theory and practice of public leadership from the local to the national to the global level. Students will learn and apply diverse approaches to leadership in a multicultural society while developing an understanding of key frameworks and practices necessary to foster collective action across private, public, and nonprofit sectors. This course will allow students to become informed citizens able to reason critically and persuasively about public matters Students will also explore and assess their own personal values, beliefs, and purpose as they develop their leadership potential.
Credit Only Granted for: PLCY201 or PUAF201.
Formerly: PUAF201.

PLCY203 Liberty and Justice for All: Ethics and Moral Issues in Public Policy (3 Credits)
Students will broaden their understanding of the moral dimensions of public policy as well as their own individual moral perspective. Discussions will include the ideal of a just society, and the place of liberty and equality in it, while focusing on contemporary theories of ethics and justice. It will develop students' appreciation of the ethical challenges unique to the public service sector while building their skills in ethical analysis and decision-making. We will explore the increasing ethical challenges in a world in which technology, global risks, and societal developments are accelerating faster than our understanding can keep pace. A framework for ethical decision-making underpins the course.

PLCY213 Foundations of Nonprofit Leadership and Social Innovation (3 Credits)
Through discussions of contemporary trends, challenges and issues, this course provides an introduction to the nonprofit and NGO sectors, social innovation, and the leadership and management skills required to achieve social impact. The course will explore the history, theories, and roles of philanthropy, the nonprofit sector, and social innovation in societies and cultures. Students will be able to demonstrate an understanding of the process and principles of social entrepreneurship and social innovation. Additionally, the course will introduce students to topics in leadership, social innovation, resource development, community mobilization through networks, the role of policy-making in creating change, project management, and overall strategies for achieving social impact. The course will include mini hands-on learning experiences that allow them to apply key learning outcomes.

PLCY214 Leading and Investing in Social Change: Re-defining and Experimenting with Philanthropy (3 Credits)
Defines philanthropy as an exploration of how one develops a vision of the public good and then deploys resources (including donations, volunteers, and voluntary associations) to achieve an impact.
Credit Only Granted for: PLCY214, PUAF214 or PUAF359I.
Formerly: PUAF359I, PUAF214.

PLCY215 Innovation and Social Change: Creating Change for Good (3 Credits)
A team-based, highly interactive and dynamic course that provides an opportunity for students to generate solutions to a wide range of problems facing many communities today. Students in the iGIVE Program will deepen their understanding of entrepreneurship and innovation practices by creating and implementing projects or ventures that address an issue of their choosing while learning topics such as communications, project management, teamwork, leadership, fundraising, project sustainability and next steps in social change.
Credit Only Granted for: PLCY215 or PUAF215.
Formerly: PUAF215.

PLCY240 Ethical, Policy and Social Implications of Science and Technology (3 Credits)
Asks students to think about how society should manage complexity, transformation, and uncertainty with an eye on developing a broader sense of ethics and social responsibility. Introduces analytical frameworks, concepts, and data collection techniques that interdisciplinary scholars use to map relationships among science, technology and society and generate important questions about the future of society.
Cross-listed with: ENES240.
Credit Only Granted for: ENES240 or PLCY240.

PLCY288 Introduction to Public Policy Topics (1-3 Credits)
Introductory-level special topics focusing on a Public Policy problem or issue area.
Repeatable to: 6 credits if content differs.

PLCY300 Governance: Collective Action in the Public Interest (3 Credits)
Examination of societal responses to public problems, including actions by government, non-profit and private sector actors, as well as civil society. Students will examine the roles of these various actors, as well as the nature of civic responsibility. The course will examine the various stages of the policy process, asking the following questions: How does something get defined as a problem that requires a public policy response? How do we think about what the options are for this response, and how do we choose among them? What are the factors that contribute to successful policy implementation? How do we evaluate the success of public policies? These questionswill be addressed using examples of current public policy problems, and students will be expected to engage in individual and collaborative work to design responses to those problems.
Prerequisite: PLCY100.
Restriction: Must be in a major in PLCY-School of Public Policy.

PLCY301 Sustainability (3 Credits)
Designed for students whose academic majors would be enhanced by the complementary study of a widely shared but hard-to-operationalize aspiration: that present choices should preserve or improve future options rather than foreclose or degrade them. How should we understand sustainability? How might we achieve it? How would we know if we had achieved it? And how could sustainability activists of a rising generation lead by example?
Cross-listed with: AGNR301, GFPL373.
Credit Only Granted for: AGNR301, GFPL373, or PLCY301.

PLCY302 Examining Pluralism in Public Policy (3 Credits)
Understanding pluralism and how groups and individuals coexist in society is an essential part of the public policy process. This course will examine the ways in which the diverse experiences of race, gender, ethnicity, class, orientation, identity, and religion impact the understanding of and equitable delivery of public policy. The examination of how identity development shapes our understanding of society and influences the decision-making process is central to students' shaping policy that is truly for the people. This course will equip students with the skills needed to analyze pluralism and draw conclusions about the application of various theories to public policy issues.
Credit Only Granted for: PLCY302 or PUAF302.
Formerly: PUAF302.

PLCY303 Public Economics Raising and Spending the People's Money (3 Credits)
Applied course in public finance, including introductions to resource mobilization (including taxation), macroeconomic policy, key public expenditure policies, and government budgetary processes and politics. The course will build on the foundations from ECON 202 to address the specific application of public finance principles to solving public problems. The course will focus on the principles of welfare economics (including market failure), economic principles as applied to particular spending programs and tax choices, and issues and institutions involved in the allocation and management of resources both at a national and subnational level. The focus of the course is on these issues from both a domestic and global perspective.
Prerequisite: ECON200.
Restriction: Must be in a major in PLCY-School of Public Policy.

PLCY304 Evaluating Evidence: Finding Truth in Numbers (4 Credits)
Enables students to understand the research done by others with a sufficiently skeptical eye to allow them to determine whether the findings of the research are valid given the assumptions made and methods used. This will involve, in part, thinking about the various problems in research design or conduct that could lead to faulty conclusions. It will also involve being able to differentiate between credible sources of information and those that are not objective. At the conclusion of the course, students should be able to differentiate objective evidence from political argumentation.
Prerequisite: STAT100.
Restriction: Must be in a major in PLCY-School of Public Policy.

PLCY306 Public Policy Analysis in Action (3 Credits)
Utilizes our unique location in the Washington, D.C. region to create a laboratory within which to analyze local, regional, national and international policy problems. Students will be put into teams and assigned to real and timely policy cases. The course will include meetings and field trips with local leaders in the field, ideally connected to the cases. Student will then expand and apply their use of policy analysis and evaluation skills to define those problems, analyze alternative responses, devise appropriate strategies for implementation, and evaluate the success of the proposed policy and implementation. The course will conclude with team presentations to local leaders and faculty. This distinctive course will serve to prepare students for their client-based senior capstone course.
Restriction: Must have earned a minimum of 60 credits; and must be in a major in PLCY-School of Public Policy.

PLCY309 Internship in Public and Nonprofit Institutions (3-6 Credits)
Offers students supervised internship placements in nonprofits as well as local, state federal or international public policy organizations.
Restriction: Permission of PLCY-School of Public Policy.
Repeatable to: 12 credits if content differs.

PLCY310 Nonprofit Leadership and Social Innovation in Action (3 Credits)
Furthers students understanding of topics in leadership, social innovation, resource development, community mobilization through networks, and the role of policy making in creating change. This course will further students understanding of the creation and leadership of nonprofits, social ventures, governance and boards; strategic planning and partnerships; advocacy and public policy processes; community outreach; working in teams, effective communications, and cross-sector approaches to scaling up social impact.
Prerequisite: PLCY 213.

PLCY311 Women in Leadership (3 Credits)
Examines the role of women in the leadership process including the participation of women as activists, voters, advocates, public leaders and as agents of change through various avenues including, among others, public service (elected and appointed), the media, community service, political organizations, and the nonprofit sector.
Credit Only Granted for: PUAF311, PLCY311 or PUAF359W.
Formerly: PUAF359W.

PLCY313 Advocacy in the American Political System (3 Credits)
Introduces students to the creation of law through the legislative process with a special focus on the Maryland General Assembly.
Credit Only Granted for: PUAF313, PLCY313 or PUAF359C.
Formerly: PUAF359C.

PLCY359 Special Topics in Study Abroad (3 Credits)
Special topics in international and global public policy.
Restriction: Permission of PLCY-School of Public Policy.
Repeatable to: 9 credits if content differs.
Credit Only Granted for: PLCY359 or PUAF359.
Formerly: PUAF359.

PLCY380 Innovation and Social Change: Do Good Now (3 Credits)
Introduces students to the concept of social innovation while exploring the many mechanisms for achieving social impact. It is team-based, highly interactive and dynamic, and provides an opportunity for students to generate solutions to a wide range of problems facing many communities today. Deepens the students understanding of entrepreneurship and innovation practices by guiding them through the creation and implementation process as applied to a project idea of their choice.
Credit Only Granted for: ARHU380, BSOS388B, PLCY388D, or PLCY380.
Formerly: PLCY388D.

PLCY386 Experiential Learning (1-6 Credits)
Prerequisite: Permission of PLCY-School of Public Policy.
Credit Only Granted for: PLCY386 or PUAF386.
Formerly: PUAF386.

PLCY388 Special Topics in Public Policy (1-3 Credits)
Advanced special topics focusing on an interdisciplinary topic related to Public Policy.
Prerequisite: Permission of PLCY-School of Public Policy.
Restriction: Sophomore standing or higher.
Repeatable to: 6 credits if content differs.
Credit Only Granted for: PLCY388 or PUAF388.
Formerly: PUAF388.

PLCY396 Fellowship Program in Political Leadership (2-6 Credits)
Individual instruction course.
Prerequisite: Permission of PLCY-School of Public Policy.
Restriction: Must be enrolled in the full-time fellowship program.
Credit Only Granted for: PLCY396 or PUAF396.
Formerly: PUAF396.

PLCY398 Fellowship Program in Political Leadership (3-6 Credits)
Prerequisite: Permission of PLCY-School of Public Policy.
Restriction: Must be enrolled in the full-time fellowship program.
Repeatable to: 12 credits if content differs.
Credit Only Granted for: PLCY398 or PUAF398.
Formerly: PUAF398.

PLCY399 Directed Study in Public Policy (1-6 Credits)
Guidance for the advanced student capable on interdisciplinary study on special projects under the supervision of faculty.
Prerequisite: Permission of PLCY-School of Public Policy.
Repeatable to: 12 credits if content differs.
Credit Only Granted for: PLCY399 or PUAF399.
Formerly: PUAF399.

PLCY400 Senior Capstone (3 Credits)
Public Policy students will take the skills and knowledge gained through their curriculum and apply them through their senior capstone course. Students will work in teams on problems and issues presented by outside clients, with guidance from faculty facilitators and interaction with the clients. Each team will work with the client to address a particular problem and produce a mutually agreed upon outcome. These hands on projects will advance students' understanding of the analytical, leadership, communication and problem solving skills necessary to address today's policy problems while allowing them to gain professional level experience that could contribute to their success in their post UMD endeavors. The course will conclude with an event that allows all teams to present their findings and outcomes to their client while being evaluated by faculty and public policy professionals.
Prerequisite: PLCY306.
Restriction: Permission of PLCY-School of Public Policy; and must have earned a minimum of 90 credits.

PLCY401 Making Policy Work: Contemporary Challenges and Solutions (3 Credits)
How do we make policies work for an increasingly diverse and dynamic populace? Today's challenges require an understanding of key variables and constraints (e.g., structural, cultural, bureaucratic, administrative) affecting both policy implementation and failure. This course allows students to analyze and evaluate current implementation plans, policies, and projects. Students will have the opportunity to create and propose future recommendations. The course is conducted in a specific policy field, denoted in the section below. It is recommended students take a related elective prior to signing up for this course.
Restriction: Must have earned a minimum of 90 credits. Public Policy majors or by permission only.

PLCY459 Advanced Special Topics in Study Abroad (3 Credits)
Advanced special topics in international and global public policy
Repeatable to: 9 credits if content differs.

PLCY488 Advanced Special Topics in Public Policy (3 Credits)
Advanced special topics for upper level students focusing on topics related to Public Policy.
Restriction: Must have earned a minimum of 60 credits.
Repeatable to: 6 credits if content differs.

PLSC - Plant Sciences

PLSC110 Introduction to Horticulture (3 Credits)
An overview to the art and science of horticulture. Relationships between plant science and plant production, the use of horticultural plants and plant stress as influenced by cultural practices.
Credit Only Granted for: PLSC100 or PLSC110 and PLSC111.
Formerly: PLSC100.

PLSC111 Introduction to Horticulture Laboratory (1 Credit)
The goal of this course is to expand your knowledge of the growth and development of horticultural crops. An integrated understanding of horticulture will come from laboratory experiments and field trips. This course is designed to complement lecture material from PLSC 110.
Corequisite: PLSC110 or permission of the Department of Plant Science and Landscape Architecture.

PLSC112 Introductory Crop Science (3 Credits)
Major crop plants including: anatomy, physiology, morphology, history, use, adaptation, culture, improvement and economic importance.
Credit Only Granted for: PLSC101 or PLSC112 and PLSC113.
Formerly: PLSC101.

PLSC113 Introductory Crop Science Laboratory (1 Credit)
An introduction to the growth, function and identification of agronomic crops and the environment in which they are produced. This course is designed to complement the lecture material from PLSC 112.
Corequisite: PLSC112 or permission of the Department of Plant Science and Landscape Architecture.
Credit Only Granted for: PLSC101 or PLSC112 and PLSC113.

PLSC115 How Safe is Your Salad? The Microbiological Safety of Fresh produce (3 Credits)
As food is produced in larger quantities and made to travel longer distances, keeping our food safe in this day and age is an ever growing challenge. This course will focus on the question of what it takes to grow and maintain safe fruits and vegetables, as food travels along the path from the farm to your fork. Food safety of fresh produce will be discussed from the public health, agricultural, economical and policy perspectives.
Recommended: PLSC110 and PLSC111; or (PLSC112 and PLSC113); or BSCI105; or (BSCI170 and BSCI171).

PLSC120 Mushrooms and Molds (3 Credits)
Students will learn about how essential fungi (mushroom, molds, and alikes) are in this world and how they affect our daily lives. They will learn how fungi interact with animals, plants and other organisms in positive and negative ways. Also, they will study the importance of fungi in biotechnology and food and how they have shaped many societies throughout history.

PLSC125 Feeding Ten Billion by 2050: Food Security and Crop Protection (3 Credits)
A big question concerning global food security is "how can we feed 10 billion people in 2050?" This course will stimulate creative thinking about possible solutions particularly from the crop production perspective. The instructors will introduce the concept of food security and different dimensions of this complex issue, identify major constraints to food security, and discuss scientific approaches that may be used to meet the grand challenge. Emphasis will be placed on topical and controversial issues such as the impact of climate change, biofuel production and GM crops on food security, and novel strategies that can improve food security.

PLSC130 Did Yeast Create Civilization? (3 Credits)
Did yeast create civilization? Fermented foods have played a major role in the transition from nomadic to settled agrarian societies, the establishment of social and religious customs, the expansion of empires, and modern economies. To what extent are our past and current attitudes towards fermented foods rooted in historical and cultural imprints? Explore the central role of fermentation in human history and culture, the basic microbiological processes underlying fermentation processes, and the processes used to produce and distribute fermented foods. Find out how the fruits, grains, and dairy products used to produce fermented foods are grown and selected. Students will learn about the development and modern use of fermented dairy products, pickles, bread, tea, chocolate, wine, beer, distilled liquors, and pharmaceutical/manufactured products.
Recommended: CHEM103, CHEM131, CHEM135, or CHEM146.
Cross-listed with: AGST130.
Credit Only Granted for: AGST130 or PLSC130.

PLSC171 Introduction to Urban Forestry (3 Credits)
Students are taught the basic concepts and principles of urban forestry. They will learn about the role of urban forests and green infrastructure as related to sustainability of local and global environments and communities. Urban forests will be studied from the perspectives of science, community development, landscape management, public policies, and laws.

PLSC201 Plant Structure and Function (3 Credits)
The relationship between plant structure and function and how the environment influences changes in the physiology to control higher plant growth and development are studied. Survey of the organizational structure of plants from the molecular to the morphological level and gain an understanding of how the plant functions to grow and reproduce.
Prerequisite: Minimum grade of C- in PLSC110 and PLSC111 or (PLSC112 and PLSC113); and minimum grade of C- in CHEM131 and CHEM132.

PLSC203 Plants, Genes and Biotechnology (3 Credits)
An overview of the history, genetics, and reproductive mechanisms for agronomic and horticultural plants that examines mechanisms of genetic improvement ranging from traditional plant breeding to tissue culture and genetic engineering. Social and political issues such as germplasm preservation and international intellectual property rights will also be discussed.
Prerequisite: Minimum grade of C- in BSCI103; or minimum grade of C- in BSCI170 and BSCI171.

PLSC205 Introduction to Turf Science and Management (4 Credits)
Principals of turf science and culture with emphasis on turfgrass anatomy, morphology, and physiology. The role of cultural interventions in achieving specific aesthetic and functional objectives is examined for multiple turf uses. Pest problems typically encountered in turfgrass management are also covered.
Credit Only Granted for: PLSC205 or PLSC305.
Formerly: PLSC305.

PLSC206 Plant Structure and Function Laboratory (1 Credit)
Provide hands-on experience for students who are concurrently taking PLSC201 or other interested students and train students how to collect quantitative data from plants and perform statistical analysis (i.e., Student's t-test and chi-square analysis) of the data using Excel. The students will also have opportunity to access and analyze biological datasets from publicly available sources to build phylogenetic trees and explore gene expression patterns.
Prerequisite: PLSC201 or permission of instructor .

PLSC226 Plant Diversity (4 Credits)
Students will learn to identify and understand relationships among major plant families of northeastern North America, especially of the Mid-Atlantic region, through lecture, field, and laboratory study. Characteristics and biogeography of and evolutionary relationships among families are emphasized in lecture. These characteristics will be woven together to provide understanding of the ecological and evolutionary drivers of plant diversity and the history of the field. Sight identification of families, genera, and species and keying skills are stressed in field and laboratory sessions.
Prerequisite: Minimum grade of C- in PLSC201 and PLSC206; or permission of instructor.

PLSC244 Herbaceous Plants (3 Credits)
Herbaceous plants are integral components of residential and commercial landscapes. Students will become familiar with 250 annual and perennial plants. The emphasis will be on plant management requirements and seasonal variation in the landscape.
Prerequisite: PLSC110 and PLSC111; or (PLSC112 and PLSC113).
Credit Only Granted for: PLSC244 or PLSC489A.
Formerly: PLSC489A.

PLSC250 Lawns in the Landscape: Environmental Hero or Villain? (3 Credits)
Examination of the lawn as an element in the anthropogenic landscape and its influence on global warming, regional air and water quality, ecological diversity, mammalian pesticide exposure and consumptive water use. Demographic and socioeconomic factors are examined in the context of being predictors of landscape aesthetic desires and lawn management behaviors. Policies that incentivize lawn alternatives or changes in lawn management behavior are discussed.Cross-listed with ENSP250.
Credit Only Granted for: ENSP250 or PLSC250.

PLSC251 Financial Applications for the Green Industry (3 Credits)
An introduction to the application of financial principles in the Green Industry business sector. Accounting, pricing, and estimating, job cost management and production efficiency are discussed and manifested in Scholarship In Practice exercises, case studies and a business plan project.
Credit Only Granted for: PLSC361 or PLSC251.
Formerly: PLSC361.

PLSC253 Woody Plants for Mid-Atlantic Landscapes I (3 Credits)
A field and laboratory study of trees, shrubs, and vines used in ornamental plantings. Major emphasis is placed on native deciduous plant materials.
Prerequisite: Minimum grade of C- in PLSC110 and PLSC111.

PLSC254 Woody Plants for Mid-Atlantic Landscape II (3 Credits)
A field and laboratory study of trees, shrubs, and vines used in ornamental plantings. Major emphasis is placed on introduced and evergreen plant materials.
Prerequisite: Minimum grade of C- in PLSC110, PLSC111, and PLSC253; or permission of instructor.

PLSC271 Plant Propagation (3 Credits)
A study of the principles and practices in the propagation of plants.
Prerequisite: Minimum grade of C- in PLSC110 and PLSC111; or minimum grade of C- in BSCI170 and BSCI171.

PLSC272 Principles of Arboriculture (3 Credits)
The establishment and maintenance of healthy trees in an urban setting will be studied. Lectures will focus on the environmental constraints to tree development in the city, and the role of physiological processes in regulating tree vigor. Laboratory exercises will cover the unique aspects of urban soils, tree valuation procedures, pruning and training, and supervised climbing.
Cross-listed with: INAG272.
Credit Only Granted for: INAG272 or PLSC272.

PLSC303 Global Food Systems (3 Credits)
An introduction to the global food system and its agricultural, biophysical, and socioeconomic domains. The problems and potentials for increasing world food supply based on current agronomic knowledge. Emphasis on international aspects of food crop production as its interrelationships with people and the environment in the developing world.
Prerequisite: Minimum grade of C- in BSCI170 and BSCI171; or students who have taken courses with comparable content may contact the department.

PLSC388 Honors Thesis Research (3-6 Credits)
Undergraduate honors thesis research conducted under the direction of an AGNR faculty member in partial fulfillment of the requirements of the College of AGNR Honors Program. The thesis will be defended to a faculty committee.
Prerequisite: Must be in the AGNR Honors Program.
Repeatable to: 6 credits if content differs.

PLSC389 Internship (1-3 Credits)
Credit will be given for practical work carried out at one or more horticultural, agronomic, landscape industries, botanical gardens, or arboreta under formally arranged internships.
Prerequisite: Permission of AGNR-Plant Science & Landscape Architecture department.
Restriction: Junior standing or higher. And must be in Plant Sciences program; or must be in Landscape Architecture program.
Repeatable to: 6 credits if content differs.

PLSC398 Seminar (1 Credit)
Oral presentation of the results of investigational work by reviewing recent scientific literature in the various phases of natural resource sciences, horticulture and agronomy.
Restriction: Senior standing. And must be in Landscape Architecture program; or must be in Plant Sciences program.

PLSC399 Special Problems in Plant Science (1-3 Credits)
Research projects in Plant Science including field, greenhouse, laboratory, studio and/or library studies. Research is conducted under the direction of a faculty member.
Prerequisite: Permission of the instructor .
Repeatable to: 6 credits.

PLSC400 Plant Physiology (4 Credits)
An in-depth examination of the unique molecular and physiological principles necessary to understand how plants grow and respond to the environment at the cellular and organismal levels. Plants evolved unique metabolism and survival strategies, so students should be prepared to enter a world that may be new to them.
Prerequisite: Minimum grade of C- in BSCI170 and BSCI171; or minimum grade of C- in PLSC201; and minimum grade of C- in CHEM231 and CHEM232; or minimum grade of C- in CHEM237.
Cross-listed with: BSCI442.
Credit Only Granted for: BSCI442 or PLSC400.

PLSC401 Pest Management Strategies for Turfgrass (3 Credits)
Interdisciplinary view of weed, disease, and insect management from an agronomy perspective. Plant responses to pest invasion, diagnosis of pest-related disorders, and principles of weed, disease and insect suppression through cultural, biological and chemical means are discussed.
Prerequisite: PLSC305.

PLSC402 Sports Turf Management (3 Credits)
Sports turf management, including design, construction, soil modification, soil cultural techniques, pesticide use, fertilization, and specialized equipment.
Prerequisite: PLSC305 and PLSC401.

PLSC404 Plant and Fungal Metabolism (3 Credits)
An introduction to biochemistry and metabolism in plants and fungi, covering the biosynthesis of compartments in plant and fungal cells with biological molecules such as nucleic acids, amino acids and lipids. Energy flow processes such as photosynthesis, carbohydrate metabolism and respiration, are covered in the course. The integration of different pathways in plant development and responses to environmental stresses will be discussed.
Prerequisite: Minimum grade of C- in BSCI170 and BSCI171; or minimum grade of C- in PLSC201 and PLSC206.

PLSC405 Agroecology (3 Credits)
How can we balance the multiple, and often competing objectives of sustainable agricultural intensification to promote both agricultural productivity and human wellbeing? The answer to this question requires a transdisciplinary, agroecological perspective. Agroecology is the integrative study of the ecology of the entire food system, encompassing ecological, economic and social dimensions. This course is designed to introduce various topics in agroecology (e.g. organic agriculture, biodiversity, the Farm Bill). We will take an ecosystems approach to the study of agriculture that will enable students to analyze the environmental, social, and economic interconnections within various types of agricultural systems locally and globally.
Prerequisite: At least one course in ecology with a minimum grade of C-; or permission of instructor.
Recommended: BSCI361 or PLSC471; or any BSCI or ENST ecology course.
Credit Only Granted for: PLSC405 or PLSC605.
Additional Information: Class will be held on campus, with two day-long field trips to local farms.

PLSC410 Commercial Turf Maintenance and Production (3 Credits)
Agronomic programs and practices used in hydroseeding, commercial lawn care, sod production and seed production. Current environmental, regulatory and business management issues confronting the turfgrass industry.
Prerequisite: PLSC305; or permission of AGNR-Plant Science & Landscape Architecture department.

PLSC411 Plant Genetics (3 Credits)
An introduction to genetic principles and technologies in plants, centered on linking phenotype to genotype. Topics include Mendelian inheritance of single and complex traits, epigenetics, population genetics and plant breeding. Examples on creating and mapping genetic mutations in both model plants and non-model crops are discussed. Current genetic and genomic approaches are highlighted, such as genome engineering and reprogramming, TILLING, and genome-wide association mapping.
Prerequisite: Minimum grade of C- in BSCI170 and BSCI171.

PLSC420 Principles of Plant Pathology (4 Credits)
An introduction to the causal agents, nature and management of plant diseases with particular attention paid to economically important diseases of horticultural and agronomic crops.
Prerequisite: Minimum grade of C- in CHEM131, CHEM132, and PLSC201; or students who have taken courses with comparable content may contact the department.

PLSC425 Green Roofs and Urban Sustainability (1 Credit)
The integration of disciplines associated with sustainability issues. Topics range from plant science to design to policy, all of which can contribute to improving the urban environment.
Credit Only Granted for: PLSC425 or PLSC489V.
Formerly: PLSC489V.

PLSC427 Plant Microbe Associations (3 Credits)
Encompasses advanced investigation and analyses of the ecology, physiology and molecular genetics of plant-microbe interactions along with their impact on crop production, ecological and food production systems.
Credit Only Granted for: PLSC489W or PLSC427.
Formerly: PLSC489W.

PLSC430 Water and Nutrient Planning for the Nursery and Greenhouse Industry (3 Credits)
Skills will be developed in order to write nutrient management plans for the greenhouse and nursery industry. Completion of this course can lead to professional certification in nutrient planning by the State of Maryland after MDA examinations are passed.
Prerequisite: Minimum grade of C- in CHEM131 and CHEM132; or minimum grade of C- in ENST200; or permission of instructor.
Recommended: PLSC432.

PLSC432 Greenhouse Crop Production (3 Credits)
The commercial production and marketing of ornamental plant crops under greenhouse, plastic houses and out-of-door conditions. Integrating an understanding of basic plant physiological mechanisms into the decision-making process for the design, construction, maintenance and day-to-day management of greenhouse operations.
Prerequisite: Minimum grade of C- in PLSC201 .

PLSC433 Technology of Fruit and Vegetable Production (4 Credits)
A critical analysis of research work and application of the principles of plant physiology, chemistry and botany to practical problems in the commercial production of fruit and vegetable crops.
Prerequisite: Minimum grade of C- in PLSC201, PLSC271, and ENST200; or students who have taken courses with comparable content may contact the department.
Restriction: Junior standing or higher.

PLSC434 The Quest for Color (3 Credits)
Finding sources of color in nature has motivated mindful inquiry and technical innovation across cultures. Yet, the quest for new colors has been both a result of and an excuse for colonization, appropriation of indigenous knowledge, and enslavement. When natural dyestuffs were largely replaced by synthetic dyes derived from coal tar in the late 1800s, color development posed new ecological and cultural challenges. In spite of these threats, practitioners worldwide have maintained their traditional methods without exploitation or petroleum products. This course integrates the history and chemistry of dye materials from plants and insects with hands-on practice in sustainable color creation. Students will hone the practical skills needed to source and process foraged dye materials, and apply them sustainably to fibers. Via this scientific process students will gain insight into the benefits of a naturally sourced approach to color and to life.
Credit Only Granted for: PLSC434 or HONR218R.
Formerly: HONR218R.

PLSC452 Environmental Horticulture (3 Credits)
Environmental horticulture principles used in the establishment and maintenance of plant materials in residential and commercial landscapes will be addressed. The effect of soil conditions, environmental factors, and commercial practices will be discussed in relation to the growth and development of newly-installed plant materials. Field diagnostics will be used by students to assess significant problems of plant decline. Environmental sustainability will be combined with current commercial practices of storm water management, nutrient management, and irrigation management to achieve an integrated approach to plant management.
Prerequisite: Minimum grade of C- in PLSC110 and PLSC111; or minimum grade of C- in PLSC112 and PLSC113; and minimum grade of C- in PLSC253 and PLSC254.

PLSC453 Weed Science (3 Credits)
Weed identification, ecology, and control (cultural, mechanical, biological, and chemical methods).

PLSC460 Application of Knowledge in Plant Sciences (3 Credits)
A capstone course based on interactions with plant science professionals and student-led class discussions. Students will apply their knowledge and experience to practical issues in the discipline, further develop critical thinking ability, and enhance their communication, teamwork, and professional skills. Topics will include nutrient management, integrated pest management, plant interactions with urban and rural ecosystems, planning of public grounds, plant biotechnology, and teaching skills.
Prerequisite: Minimum grade of C- in PLSC110 and PLSC111; or minimum grade of C- in PLSC112 and PLSC113; or minimum grade of C- in PLSC201; or permission of instructor.
Recommended: ENGL393 and ENST200; and (PLSC389 or PLSC399).
Restriction: Senior standing or higher.

PLSC461 Cultural Management of Nursery and Greenhouse Systems: Substrates (1 Credit)
One of three 1-credit modules (PLSC461, PLSC462 and PLSC464)covering the management techniques used in the intensive culture of plants in commercial operations. Specifically, this module covers the composition, handling, physical and chemical properties of substrates and how they should be managed to maximize plant growth.
Credit Only Granted for: PLSC461 or PLSC489T.
Formerly: PLSC489T.
Additional Information: Course material is delivered primarily online, but a four hour face-to-face lecture/lab will be held at the end of the module. PLSC461, PLSC462 and PLSC464 will be taught sequentially during the semester.

PLSC462 Cultural Management of Nursery and Greenhouse Systems; Irrigation (1 Credit)
One of three 1-credit modules (PLSC461, PLSC462 and PLSC464) covering the management techniques used in the intensive culture of plants in commercial operations. Specifically, this module covers water quantity and quality issues, water supply (basic hydraulics), irrigation system design and irrigation system evaluation (performance) to maximize water application efficiency.
Credit Only Granted for: PLSC462 or PLSC489W.
Formerly: PLSC489W.
Additional Information: Course material is delivered primarily online, but a four hour face-to-face lecture/lab will be held at the end of the module. PLSC 461, 462 and 464 will be taught sequentially during the semester.

PLSC464 Cultural Management of Nursery and Greenhouse Systems: Nutrients (1 Credit)
One of three 1-credit modules (PLSC461, PLSC462 and PLSC464) covering the management techniques used in the intensive culture of plants in commercial operations. Specifically, this module covers the basics of fertilization, different fertilization strategies and nutrient use and efficiency, to optimize nutrient application practices in intensive plant production systems.
Credit Only Granted for: PLSC464 or PLSC489Z.
Formerly: PLSC489Z.
Additional Information: Course material is delivered primarily online, but a four hour face-to-face lecture/lab will be held at the end of the module. PLSC 461, 462 and 464 will be taught sequentially during the semester.

PLSC471 Forest Ecology (3 Credits)
An understanding of the forest ecosystem, its structure and the processes that regulate it are provided. It also considers changes that occur in forests, the interaction of environment and genetics in promoting ecosystem sustainability, and the role of human influences on urban forest ecosystems.
Prerequisite: Minimum grade of C- in PLSC201; or minimum grade of C- in BSCI160 and BSCI161; or minimum grade of C- in BSCI106.

PLSC472 Capstone-Urban Forest Project Management (3 Credits)
Students will synthesize the ideas and information learned from their studies in urban forestry. Working in teams, students will complete projects involving real-world issues. Student projects will use scientific, social, political and ethical considerations in an interdisciplinary approach to provide solutions to their problem.
Prerequisite: Minimum grade of C- in ENST200, PLSC272, and PLSC471.
Restriction: Senior standing or higher; and must be in a major within AGNR-Plant Science & Landscape Architecture department.

PLSC473 Woody Plant Physiology (3 Credits)
Concentration is placed on physiological processes important to woody plant growth and development. Emphasis will be placed on current concepts and theories of how woody plants grow and develop, and the critical assessment of current research in woody plant physiology. Course readings will include textbook assignments and selected papers from the current scientific literature.
Prerequisite: Minimum grade of C- in PLSC400 or BSCI442; or minimum grade of C- in PLSC201 and PLSC206; or students who have taken courses with comparable content may contact the department.

PLSC476 Data Wrangling and Visualization Using R (3 Credits)
Through a combination of lecture, hands-on demos, quizzes, and increasingly independent coding exercises and a project, you will learn the fundamentals of using the R statistical language. You will gain experience getting your data into R, wrangling it into the form needed for your chosen analysis, visualizing the data, getting your results out of those analyses, and documenting your workflow greater scientific community. Instead of focusing on a few specific types of analyses, you will learn basic skills and general principles that you can use to analyze data for your field.
Credit Only Granted for: PLSC489R or PLSC476 .
Formerly: PLSC489R.

PLSC480 Urban Ecology (3 Credits)
Cities are rapidly increasing in number and size across the globe, transforming local ecosystems. This course examines urban environments as coupled social-ecological systems at multiple scales, from streets and parks to urban landscapes patterns and global patterns of biodiversity. Ecological principles are applied in the urban context, including habitats, biodiversity, ecological processes, and ecosystem services of urban environments, with applications to problems in urban land management, decision-making and design.
Prerequisite: Minimum grade of C- in PLSC471, ENST360, BSCI363, or BSCI160; or other coursework/experience considered for instructor permission.
Additional Information: Class will be held both on campus and at other locations such as the U.S. Botanic Garden, local parks, and urban and suburban locations off campus.

PLSC481 Vegetation Assessment and Analysis (2 Credits)
An overview of vegetation assessment through the collection of data in the field (e.g. plots and transects) and the analysis of existing data and remotely detected images (e.g. Aerial photographs and GIS layers).
Prerequisite: PLSC110 and PLSC111; or (BSCI160 and BSCI161); or permission of instructor.
Recommended: PLSC201, BSCI360, PLSC226, or PLSC471.

PLSC489 Special Topics in Plant Science (1-3 Credits)
A lecture and or laboratory series organized to study a selected phase of Plant Science not covered by existing courses. Credit according to time scheduled and organization of the course.
Repeatable to: 6 credits if content differs.

PORT - Portuguese

PORT103 Intensive Elementary Portuguese (4 Credits)
Covers speaking, reading, writing, listening, and culture of Portuguese-speaking world.
Prerequisite: Must have appropriate World Language Placement (WLP) score.
Credit Only Granted for: PORT103 or PORT104.
Formerly: PORT104.

PORT203 Intensive Intermediate Portuguese (4 Credits)
Covers speaking, reading, writing, listening, and culture of Portuguese-speaking world.
Prerequisite: PORT103 or PORT104; or must have appropriate World Language Placement (WLP) score.
Credit Only Granted for: PORT203 or PORT204.
Formerly: PORT204.

PORT205 Intermediate Reading and Conversation in Portuguese I (3 Credits)
Development of spoken Portuguese at intermediate level based on written assignments and exams on readings in a variety of genres.
Prerequisite: PORT203; or permission of ARHU-School of Languages, Literatures, and Cultures department.

PORT207 Intermediate Reading and Conversation in Portuguese II (3 Credits)
Advanced practice of oral and written Portuguese. Reading and discussions of texts, review of grammar, and vocabulary practice.
Prerequisite: PORT205; or students who have taken courses with comparable content may contact the department.

PORT222 Cannibals, Savages and Carnivalization: The Making of Brazilian National Culture (3 Credits)
Introduction to the main concepts, cultural movements, and ideas that have shaped Brazilian modern culture. Exploring some of the ways in which cultural cannibalism, savagery, and carnivalization have been deployed as symbolic frameworks in the construction of a national identity through analyses of film, literature, music and visual arts. Taught in English.

PORT224 Brazilian Culture (3 Credits)
Pluralistic formation of Brazilian culture, based on European, African and Indian contributions. Lectures, discussions, slides, video, and film presentations. Taught in English.

PORT228 Selected Topics in Latin American Literature and Society (3-6 Credits)
Variable cultural studies topics on literature and society in contemporary Latin America. Taught in English.
Cross-listed with: SPAN228.
Repeatable to: 6 credits if content differs.
Credit Only Granted for: PORT228 or SPAN228.

PORT229 Selected Topics in Latin American Culture (1-3 Credits)
Varied topics in Latin America culture.
Repeatable to: 9 credits if content differs.

PORT230 Brazilian Portuguese through Film (3 Credits)
Intermediate practice of oral and written Portuguese through discussion of Brazilian movies, along with grammar review and vocabulary exercises. Taught in Portuguese.
Prerequisite: PORT205; or permission of ARHU-School of Languages, Literatures, and Cultures department.

PORT234 Issues in Latin American and Caribbean Studies I (3 Credits)
Interdisciplinary study of major issues in Latin America and the Caribbean, including Latin America's cultural mosaic, migration and urbanization. Democratization and the role of religions. Taught in English.
Cross-listed with: LACS234, SPAN234.
Credit Only Granted for: LASC234, PORT234, SPAN234, or LACS234.
Formerly: LASC234.

PORT235 Issues in Latin American and Caribbean Studies II (3 Credits)
Major issues shaping Latin American and Caribbean societies including the changing constructions of race, ethnicity, gender and class as well as expressions of popular cultures and revolutionary practices. Taught in English.
Cross-listed with: LACS235, SPAN235.
Credit Only Granted for: LASC235, PORT235, SPAN235, or LACS235.
Formerly: LASC235.

PORT269 Special Topics in Study Abroad II (1-6 Credits)
Special topics course taken as part of an approved study abroad program.
Repeatable to: 15 credits if content differs.

PORT320 Survey of Portuguese Literature (3 Credits)
Portuguese poetry, fiction and drama from the Twelfth Century to the present. Taught in English.

PORT332 Brazilian Cinema (3 Credits)
Brazilian films from the late 1950s to the present with a special view to the relationship between cinema, society, historical dates, and social changes in Brazil. Taught in English.
Cross-listed with: CINE332.
Credit Only Granted for: PORT332, CINE332, or FILM332.
Formerly: FILM332.

PORT369 Special Topics in Study Abroad III (1-6 Credits)
Special topics course taken as part of an approved study abroad program.
Repeatable to: 15 credits if content differs.

PORT386 Experiential Learning (3-6 Credits)
Restriction: Permission of ARHU-School of Languages, Literatures, and Cultures department; and junior standing or higher.

PORT388 Special Topics in Brazilian Studies (3 Credits)
Exposes students to textual, visual and aural products to explore how Brazil has been shaped from within and abroad. Focuses on the broad meaning and impact on Brazilian culture and social formation. Taught in English.
Repeatable to: 6 credits if content differs.

PORT399 Independent Study in Portuguese (1-3 Credits)
Specific readings in literature under the supervision of a faculty member of the department.
Prerequisite: Permission of ARHU-School of Languages, Literatures, and Cultures department.
Repeatable to: 3 credits.

PORT405 Portuguese for Spanish Speakers (3 Credits)
Intensive basic grammar, reading and auditory comprehension. Native or acquired fluency in Spanish required.
Restriction: Must have native or acquired fluency in Spanish.

PORT408 Special Topics in Portuguese Literature (3 Credits)
Major themes and literary developments from the late 18th century to the present.
Repeatable to: 6 credits if content differs.

PORT409 Special Topics in Brazilian Literature (3-6 Credits)
Major themes and literary development from the late eighteenth century to the present. Specific topic to be announced each time the course is offered.

PORT410 Tropical Dreams: Nature and Art in Brazil (3 Credits)
Ideas, images, and representations of the tropics have historically portrayed them as exotic, lush, underdeveloped, and resource-rich places. This course interrogates how concepts of tropicality and nature have influenced the culture, politics, and society of a particular country: Brazil. We examine how nature, a key concept in tropicality, has been represented and understood in different terms throughout history and how these representations have informed environmental discourses and attitudes. Furthermore, we critically analyze how racialized notions of the tropics that shaped structures of oppression have been constructed, perpetuated, and contested. Our objects of analysis will consist of artistic depictions of the tropical world in addition to films, music, literature, and critical thought.
Credit Only Granted for: PORT409A, SPAN609A, LACS448Y, or PORT410.
Formerly: PORT409A.

PORT478 Themes and Movements of Luso-Brazilian Literature in Translation (3 Credits)
A study of specific themes and movements either in Portuguese or Brazilian literature, as announced. Designed for students for whom the literatures would be inaccessible in Portuguese.
Repeatable to: 6 credits if content differs.

PORT480 Machado de Assis (3 Credits)
Fiction of Machado de Assis covering his romantic and realistic periods.
Prerequisite: Permission of ARHU-School of Languages, Literatures, and Cultures department.

PSIT - Public Service Interpreting and Translation

PSIT310 Fundamentals of Translation (3 Credits)
Students will develop a systematic, reflective approach to translation involving both the written and spoken word. The course provides an overview of domains of translation, associated text categories, and translation tasks.
Restriction: Must be in the Public Service Interpreting and Translation major.

PSIT320 Fundamentals of Interpreting (3 Credits)
Students will develop a systematic, reflective approach to interpreting in real-world settings and gain an understanding of the use of different modes of interpreting under professional working conditions. This course also provides an overview of interpreting skills, with exercises to develop them, including focus on active listening and analysis, effective use of memory, and delivery of the target message. Interpreting strategies and techniques in both dialogue and formal consecutive settings are discussed in a range of interpreting domains and practiced in the context of real-world exercises, enabling students to develop strategies to identify, analyze, and resolve difficulties and challenges in professional practice contexts.
Restriction: Must be in the Public Service Interpreting and Translation major.

PSIT388 Public Service Interpreting and Translation Practicum (3 Credits)
Designed to help guide students in the pursuit of experiences to practice their skills in workplace settings through internships, volunteering, and practice sessions.
Prerequisite: Minimum grade of C- in PSIT310 and PSIT320.
Restriction: Must be in the Public Service Interpreting and Translation major.
Repeatable to: 6 credits.

PSIT410 Public Service Translation (3 Credits)
In this course, students will advance their skills in public service translation across a diversity of work areas and settings. They will be introduced to a variety of text types strengthening the skills introduced in Fundamentals of Translation. Students will also expand their command of technical vocabulary across two or more languages in the contexts of education, local and state government, health care, and legal services.
Prerequisite: Minimum grade of C- in PSIT310.
Restriction: Must be in the Public Service Interpreting and Translation major.

PSIT420 Public Service Interpreting (3 Credits)
Students will advance their skills in consecutive interpreting across a diversity of public service settings. Simultaneous interpreting skills will be introduced. This course will strengthen the skills introduced in Fundamentals of Interpreting.
Prerequisite: Minimum grade of C- in PSIT320.
Restriction: Must be in the Public Service Interpreting and Translation major.

PSYC - Psychology

PSYC100 Introduction to Psychology (3 Credits)
A basic introductory course intended to bring the student into contact with the major problems confronting psychology and the more important attempts at their solution.

PSYC123 The Psychology of Getting Hired (1 Credit)
Designed to introduce students to the science behind the hiring process and to prepare individuals with the academic and practical training required. Together we will explore psychological principles that influence the selection process and how individuals can apply them for the competitive edge that makes others Fear the Turtle!
Restriction: Must not be in a Robert H. Smith School of Business degree program.
Additional Information: Cannot be used in place of BMGT367 toward a degree program in the Robert H. Smith School of Business.

PSYC138 Special Topics in Study Abroad I (1-6 Credits)
Special topics course taken as part of an approved study abroad program.
Repeatable to: 15 credits if content differs.

PSYC200 Statistical Methods in Psychology (3 Credits)
A basic introduction to quantitative methods used in psychological research.
Prerequisite: PSYC100; and 1 course with a minimum grade of C- from (STAT100, MATH107, MATH111, MATH120, MATH130, MATH136, or MATH140).

PSYC202 Introduction to Neuroscience (3 Credits)
In an evolutionary sense, the job of the nervous system is to produce, control, and coordinate behaviors that help an animal survive and reproduce. Neuroscience is the study of how the nervous system does that. Provides a broad introduction to neuroscience, always keeping the behavioral consequences in view.
Prerequisite: Minimum grade of C- in BSCI170 and BSCI171.
Cross-listed with: NEUR200.
Credit Only Granted for: PSYC309U, NEUR200, PSYC202 or PSYC301.
Formerly: PSYC309U.

PSYC210 Personality and Temperament: Developmental Origins, Brain Bases, and Clinical Implications (3 Credits)
What is known about what makes each of us unique? How do these differences contribute to enduring differences in health & wealth? We will review recent research in humans and non-humans aimed at understanding the psychological & biological mechanisms underlying stable individual differences in personality. We will discuss the phylogenetic and ontogenetic origins of temperament, measurement issues, fundamental dimensions of personality across the lifespan, neurobiological substrates of temperament/personality, mechanisms contributing to stability and change, implications for psychopathology, & broader implications for public/macroeconomic policy.
Prerequisite: PSYC100.
Restriction: Must be in Psychology program.

PSYC221 Social Psychology (3 Credits)
The influence of social factors on the individual and on interpersonal behavior. Includes topics such as conformity, attitude change, personal perception, interpersonal attraction, and group behavior.
Prerequisite: PSYC100.

PSYC232 Psychology of Racism (3 Credits)
Explores the causes, correlates, and consequences of racial prejudice in the United States and other national contexts. Using lecture, readings, and discussion, we will examine the psychological theory and research on what processes underlie and motivate racial prejudice; how racial prejudice is experienced by its targets; how racial prejudice pervades our culture and social institutions; and how racial prejudice is learned, maintained, and ultimately changed.
Restriction: Limited to Psychology majors; if spaces remain in the course, will open to all majors.

PSYC234 Living the Good Life: The Psychology of Happiness (3 Credits)
What are the secrets to living a happy life? Can happiness be found within the context of war, a depressed economy, violence and other major stressors? Are some people born happier than others? This course will teach you the scientific process that psychologists use to study happiness (and related emotional variables) and give you the opportunity to practice applying that process in a number of ways. You will learn how we (a) gather and critically evaluate research findings in the existing literature, (b) integrate those findings into coherent and testable theories, (c) design and conduct valid scientific research that tests those theories and extends our knowledge, and (d) effectively communicate our theories and findings to a wide range of audiences. The result of the process is a more accurate and objective understanding of happiness, and that is what prepares you to apply your scientific understanding to explain and influence a wide range of outcomes.
Credit Only Granted for: PSYC234 or PSYC289D.
Formerly: PSYC289D.

PSYC237 Psychology of Evil (3 Credits)
Why is there evil in the world? Are some born evil, or do social, environmental and cultural forces create evil? What makes otherwise good people do evil things? The scientific study of evil epitomizes the fundamental challenge that psychology faces in dissecting the role of biology (nature) and the social context (nurture).
Credit Only Granted for: PSYC237 or PSYC289E.
Formerly: PSYC289E.

PSYC238 Special Topics in Study Abroad II (1-6 Credits)
Special topics course taken as part of an approved study abroad program.
Repeatable to: 15 credits if content differs.

PSYC262 Asian American Psychology (3 Credits)
An overview of how socio-cultural influences impact the development and psychological health of Asian Americans. Other topics include how minority group status, adaptation and identity development influence various aspects of psychological functioning; the role of historic systematic racism; and, how the COVID-19 pandemic has negatively impacted Asian Americans. Students develop a deeper understanding of the role of stereotypes and racism, acculturation, racial identity development, cultural values, gender socialization, behavioral norms, family roles, stressors and social support systems on the mental health, well-being and health of Asian Americans.
Cross-listed with: AAST262.
Credit Only Granted for: PSYC262, AAST262 or PSYC489Z.
Formerly: PSYC489Z.

PSYC300 Research Methods in Psychology Laboratory (4 Credits)
A general introduction and overview to the fundamental theoretical, conceptual, and practical issues in psychological research in both the laboratory and the field.
Prerequisite: PSYC200.
Restriction: Must be in Psychology program or Social Data Science - Psychology Track.

PSYC302 Fundamentals of Learning and Behavior (3 Credits)
Overview of the fundamental types of learning that occur without formal instruction. The course covers fundamentals of classical and instrumental conditioning as studied in a variety of species in addition to more modern theories of learning. We will then explore how these principles influence diverse processes such as memory, attention, extinction, categorization, motivation, and in some cases, how they are implemented in the brain and disrupted in disease.
Prerequisite: PSYC100, BSCI170, and BSCI171.
Restriction: Restricted to psychology majors during the registration period; all other majors will be placed on a hold file.

PSYC303 Professional Development for Psychology Majors (1 Credit)
An investigation of various career and graduate school opportunities available to psychology majors. Students will learn about a wide range of career fields, will learn how to utilize available resources to pursue career goals, and will take steps to advance their professional identity and development.
Prerequisite: PSYC123; or permission from the instructor with a completed resume.
Restriction: Must have earned a minimum of 60 credits; and must be in the Psychology major.

PSYC304 Biological Psychology (3 Credits)
Biological Psychology is the study of the physiological basis of behavior. In this course, we will first cover the basic principles of brain organization and neural transmission. We will then introduce traditional and modern research techniques in the field of behavioral neuroscience. The last portion of the course focuses on specific topics including psychopharmacology, learning and memory, emotion, stress, drug of abuse, neurological disorders (e.g., Alzheimer's disease and Parkinson's disease) and schizophrenia.
Prerequisite: PSYC100, BSCI170 and BSCI171; or equivalent.
Credit Only Granted for: PSYC301 or PSYC304.
Formerly: PSYC301.

PSYC307 Collective Behavior and Decision Making in Human and Animal Groups (3 Credits)
Overview of the fundamental principles underlying the organization of animal societies, mathematical models describing these phenomena, and applications to human societies and decision-making. Students will engage in discussions of case studies, analyze and evaluate mathematical simulations, and apply what they have learned from animal groups to practice solving problems currently facing human society.
Prerequisite: NEUR200, PSYC304 or PSYC221.
Recommended: PSYC200 or equivalent statistics course.
Credit Only Granted for: PSYC207 or PSYC307.
Formerly: PSYC207.

PSYC309 Special Topics in Psychology (1-3 Credits)
Topics of current interest which represent extensions of or additions to topics covered in more general topical courses.
Prerequisite: PSYC100.
Restriction: Must be in Psychology program; and sophomore standing or higher.
Repeatable to: 6 credits if content differs.

PSYC310 Perception (3 Credits)
A survey of phenomena and theories of perception including psychological, anatomical, physiological, and environmental factors important in determining how we perceive the world. Historical background will be examined as well as contemporary research.
Prerequisite: PSYC100, BSCI170 and BSCI171.
Restriction: Must be in the Psychology major, Neuroscience major, or Social Data Science major (Psychology track).

PSYC330 Child Psychopathology (3 Credits)
Etiology, diagnosis, prevention and treatment of emotional disorders of childhood and adolescence.
Prerequisite: PSYC100.
Restriction: Must be in Psychology program or Social Data Science - Psychology Track.
Credit Only Granted for: PSYC309B or PSYC330.
Formerly: PSYC309B.

PSYC332 Psychology of Human Sexuality (3 Credits)
A survey of historical and contemporary psychological views on a wide variety of sexual behaviors; theory and research bearing on the relationship between life span psychological development, psychological functioning, interpersonal processes and sexual behaviors; political and social issues involved in current sexual norms and practices.
Prerequisite: PSYC100.

PSYC334 Psychology of Interpersonal Relationships (3 Credits)
Research, theory and their practical applications pertaining to the development, maintenance and dissolution of human relationships. Processes critical to successful relating (e.g., communication, bargaining, conflict resolution), and issues associated with troubled dyadic relations with equal partners (e.g., jealousy, spouse abuse, divorce).
Prerequisite: PSYC100.

PSYC336 Psychology of Women (3 Credits)
A study of the biology, life span development, socialization, personality, mental health, and special issues of women.
Prerequisite: PSYC100.
Cross-listed with: WGSS336.
Credit Only Granted for: PSYC336, WMST336 or WGSS 336.
Formerly: WMST336.

PSYC338 Special Topics in Study Abroad III (1-6 Credits)
Special topics course taken as part of an approved study abroad program.
Repeatable to: 15 credits if content differs.

PSYC341 Introduction to Memory and Cognition (3 Credits)
An introduction to the basic concepts of cognitive psychology, the scientific study of mental processes. Topics will include perception, attention, memory, reasoning, and language, with an emphasis on how findings from cognitive psychology can inform real-life thinking (e.g., memory strategies for studying, pitfalls of multitasking, and how/why our memories can fail us).
Prerequisite: PSYC200 and PSYC300.

PSYC344 Health Psychology (3 Credits)
An examination of how psychological, biological, and social factors impact physical health and well-being. Students will use the biopsychosocial model to analyze topics including stress, health disparities, pain, addiction, disease states (e.g., cardiovascular disease, diabetes, cancer), and primary prevention.
Prerequisite: PSYC100; or permission of instructor.
Restriction: Must be in the Psychology program; or must be in a major within the School of Public Health; or permission of instructor.
Credit Only Granted for: PSYC489U or PSYC344.
Formerly: PSYC489U.

PSYC346 Death, Dying and Grieving: What Future Healthcare Professionals Need to Know (3 Credits)
What do future healthcare professionals need to know about death dying and grieving? Theories and research related to death, dying and grieving, interventions with the dying and grieving, and communication about end-of-life issues in healthcare settings will be examined. Topics include trajectories of common illnesses, palliative and hospice care, ethical and multicultural issues, suicide, models of grieving, post-traumatic growth, and self-reflection regarding values, biases, and beliefs regarding death. This class will prepare students for careers as psychologists, physicians, nurses, or social workers as they will obtain foundational knowledge, engage in self-reflection, and practice communication skills that can be used with future clients or patients who are dying or grieving the dying/death of a loved one.
Prerequisite: PSYC100.

PSYC353 Adult Psychopathology (3 Credits)
The nature, diagnosis, etiology, and treatment of mental disorders.
Prerequisite: PSYC100.
Restriction: Must be in Psychology program or Social Data Science - Psychology Track.

PSYC354 Multicultural Psychology in the U.S. (3 Credits)
What are the psychological implications of racism, sexism, homophobia and other structures of inequality in the United States? How do socio-cultural privilege and oppression influence individual and group thoughts, feelings, and behaviors? This course will take a current events focus to understanding multicultural and social justice issues in psychology with an emphasis on self-reflection, mental health, cross-cultural communication, and strategies for social change.
Prerequisite: PSYC100.

PSYC355 Developmental Psychology (3 Credits)
Survey of research and theory of psychological development from conception through childhood, stressing physiological, conceptual and behavioral changes, and the social and biological context in which individuals develop.
Prerequisite: PSYC100.

PSYC361 Survey of Industrial and Organizational Psychology (3 Credits)
A general survey of the field of industrial organizational psychology including such topics as organizational entry (recruitment, selection, training, socialization); organizational psychology (motivation, leadership, job attitudes); productivity in the workplace (performance appraisal, absenteeism, turnover), and the role that the larger environment plays in influencing work behaviors and work attitudes.
Prerequisite: PSYC100.

PSYC362 Introduction to Negotiation (3 Credits)
Overview of the field of negotiation and the social-psychological and contextual factors that facilitate and inhibit successful negotiation agreements. Students will engage in a variety of negotiation exercises individually and as a team.
Restriction: Must be in Psychology program or Social Data Science - Psychology Track.

PSYC381 Community Interventions: Domestic Violence I (3 Credits)
Study theories and research related to the dynamics and effects of intimate partner violence on women and children. Learn about community resources and interventions for survivors of domestic violence. Examine theoretical writings and research findings regarding the effects of gender, culture, race/ethnicity, and socioeconomic status on the experiences of intimate partner violence survivors and their children.
Prerequisite: PSYC100.
Restriction: Preference given to majors in Human Development, Psychology, and Women, Gender and Sexuality Studies.
Credit Only Granted for: PSYC318D, PSYC381, WMST498A or WGSS498A.
Formerly: PSYC318D.
Additional Information: Students who successfully complete this course may be eligible to enroll in PSYC319 - a service learning class in which students volunteer in the community to work with children who have experienced domestic violence and/or homelessness.

PSYC389 Experiential Learning (1-6 Credits)
Internship in psychology-related fields.
Prerequisite: PSYC100; and permission of BSOS-Psychology department; and 9 credits in PSYC courses.
Restriction: Minimum cumulative GPA of 2.8; and must have earned a minimum 3.0 Psychology GPA.
Repeatable to: 9 credits.

PSYC391 Community Interventions: Domestic Violence II - Service Learning (3 Credits)
Apply knowledge gained in PSYC318D/PSYC318 to provide interventions to individuals who have experienced domestic violence. Critical analysis of interventions and related research. Ethical and cultural considerations in the provision of services are addressed.
Prerequisite: PSYC381 or PSYC318D.
Restriction: Preference given to majors in Psychology; Women, Gender, and Sexuality Studies; and Human Development; and permission of BSOS-Psychology department.
Credit Only Granted for: PSYC319D or PSYC391.
Formerly: PSYC319D.

PSYC401 Biological Bases of Behavior Laboratory (4 Credits)
Students will study some of the key concepts in neuroscience by combining behavioral experiments with electrode recordings from neurons controlling the behaviors. We will intensively examine concepts like creation of rhythmic behaviors (walking, flight), neurotransmitters' control of aggression, drug effects on synaptic activity, high-speed neural circuits for effective escape from predators, and CNS maps in the visual system for directing prey capture. Students will learn microsurgery and a broad range of neural recording techniques. We work with animals (invertebrates, cold-blooded vertebrates) every week. A strong biology background will be beneficial.
Prerequisite: PSYC300; and (PSYC202, NEUR200, or BSCI353).
Restriction: Permission of instructor; and must be in Psychology program; and must have earned a minimum of 85 credits.
Credit Only Granted for: PSYC401, NEUR405, BSCI455 or BSCI454.

PSYC403 Animal Behavior (3 Credits)
Reviews the theoretical framework underlying the study of animal behavior. The genetic, hormonal and physiological basis of behavior, and the relation to ecological and evolutionary processes will be discussed using examples that range from invertebrate animals to humans.
Prerequisite: PSYC202 or NEUR200.

PSYC404 Introduction to Behavioral Pharmacology (3 Credits)
Theoretical viewpoints on the interaction of drugs and behavior. Basic principles of pharmacology, the effects of drugs on various behaviors, experimental analysis of drug dependence and abuse, and neuropharmacology and behavior.
Prerequisite: PSYC202 or NEUR200.
Restriction: Must be in Psychology program.

PSYC406 Neuroethology (3 Credits)
A merger between the disciplines of neuroscience and ethology (animal behavior) studies the behavioral functions of nervous systems using a comparative and evolutionary approach. Students will learn how the nervous system controls behavioral patterns in a variety of different organisms ranging from insects to mammals.
Prerequisite: PSYC301, PSYC202 or NEUR200.
Restriction: Must be in Psychology program.

PSYC407 Behavioral Neurobiology Laboratory (4 Credits)
In this lab course, you will collect behavioral and physiological data in humans using classic behavioral paradigms, design models of neural circuits that can explain those behaviors, record neural activity from the roach, and write lab reports describing your results and how they relate to patients with psychiatric illnesses.
Prerequisite: PSYC300; and (PSYC202 or NEUR200).
Restriction: Must be in Psychology program; and must have earned a minimum of 85 credits.

PSYC409 Topics in Neurosciences Seminar (1 Credit)
Current research in neurosciences will be presented, read, and discussed. Emphasis will change each term.
Restriction: Permission of BSOS-Psychology department; and junior standing or higher.
Repeatable to: 4 credits if content differs.

PSYC411 Introduction to Functional Magnetic Resonance Imaging (3 Credits)
An introduction to functional magnetic resonance imaging (fMRI). Students will be taught about formulating testable hypotheses with fMRI, utilizing basic methods in fMRI studies, and understanding existing limitations of fMRI studies in the literature.
Prerequisite: PSYC200 and PSYC300; and (PSYC202 or NEUR200).
Restriction: Must be in the Psychology major or Neuroscience major.
Credit Only Granted for: NACS728F or PSYC411.

PSYC414 Science of Sleep and Biological Rhythms (3 Credits)
Sleep is a powerful, inescapable, misunderstood, and mysterious presence in our lives. The course will begin with a review of the basics of sleep and biological rhythms with a focus on the underlying neurobiology. The bulk of the semester will be in-depth discussions of topics in sleep and circadian rhythms primarily chosen by the students. A few examples: narcolepsy, sleep in primitive cultures, lucid dreaming, racial and cultural differences in sleep and sleep disorders, the biology of sleep and circadian rhythms during adolescence, CNS control of dreaming, sleep and states of consciousness, sleeping to remember vs. sleeping to forget, legal ramifications of parasomnias, e.g. sleepwalking, and the relationships between sleep deprivation and obesity.
Prerequisite: PSYC301, PSYC202, or NEUR200; or permission of instructor.
Restriction: Must be in a major within the BSOS-Psychology department; and restricted to psychology majors during the registration period.

PSYC416 Development of Attachment in Infancy and Childhood: Theory, Research, Methods, and Clinical Implications (3 Credits)
Overview of the development of attachment during infancy and childhood, examining theory, research methods, research findings, and clinical implications. Students will observe videos of attachment assessments, lead class discussion of readings, make class presentations, and complete writing assignments.
Prerequisite: PSYC355; or permission of instructor.
Restriction: Must be in a major within the BSOS-Psychology department.

PSYC417 Data Science for Psychology and Neuroscience Majors (4 Credits)
A large number of industry and academic jobs require basic programming and data analysis skills. This class represents an introduction to both. Students will learn to program in R and will briefly be introduced to Python, the two most popular programming languages for data science. Common constructs shared by a variety of procedural programming languages will be emphasized. Basic statistics and probability theory will be reviewed from a computational perspective, and more advanced topics introduced. During the course, students will simulate toy data sets which they will then analyze knowing how the data came about, as well as work with real data. The class is highly hands-on with a large number of in-class lab and homework projects. Expect to work a lot and move quickly. Because of the hands-on nature of the class, the overall focus is more on application and execution rather than theory. However, some theory is covered at a high level so that students are aware of why they are doing something, rather than mindlessly writing code.
Prerequisite: PSYC200 and PSYC300; and (MATH120, MATH130, or MATH140).
Credit Only Granted for: PSYC489D or PSYC417.
Formerly: PSYC489D.

PSYC420 Experimental Psychology: Social Psychology Laboratory (4 Credits)
A laboratory course to provide a basic understanding of experimental methods in social psychology and experience in conducting research on social processes.
Prerequisite: PSYC300 and PSYC221.
Restriction: Must be in Psychology program or Social Data Science - Psychology Track; and must have earned a minimum of 85 credits.

PSYC424 Communication and Persuasion (3 Credits)
Effect of social communication upon behavior and attitudes. Theory and research concerning attitude change and social influence.
Prerequisite: PSYC221 and PSYC200.

PSYC425 Psychology and Law (3 Credits)
An introduction to the intersection of psychology and the criminal justice system, known as the field of legal psychology. The material covered will span the course of the criminal justice process and examine each aspect from a psychological perspective beginning with profiling and moving on to eyewitness memory and judgements through perpetrator memories and interrogation techniques. These aspects will be evaluated with a research lens as well as an applied outlook.
Prerequisite: PSYC100, PSYC200, and PSYC300.
Restriction: Must be in Psychology program or Social Data Science - Psychology Track.
Credit Only Granted for: PSYC325 or PSYC425.

PSYC426 Psychology of Adolescents' Close Relationships: Parents, Peers, and Romantic Partners (3 Credits)
An examination of the development of close relationships during adolescence, including those with parents, peers, and romantic partners. We consider core developmental themes including nature and nurture, stability and change, and individual differences, and discuss theory, research, and clinical applications. Students gain observational skills through discussing extensive video examples of social interactions.
Prerequisite: PSYC355; or permission of the instructor.
Credit Only Granted for: PSYC426 or PSYC489B.
Formerly: PSYC489B.

PSYC431 Human and Animal Intelligence (3 Credits)
The study of intelligence touches upon a broad range of topics from cognition, animal behavior, philosophy, psychology, and linguistics. Through lectures, discussions, and critical evaluation of opposing arguments, we will investigate the construct of intelligence from an evolutionary perspective. An understanding of animal intelligence also has important applications for understanding cognition in general, the design of robotic controls, investigating human health, conserving endangered species, development of artificial intelligence, and assuring animal welfare.
Prerequisite: PSYC300.
Credit Only Granted for: PSYC431 or PSYC489R.
Formerly: PSYC489R.

PSYC432 Counseling Psychology: Theories, Research, and Practice (3 Credits)
Analysis of research and intervention strategies developed and used by counseling psychologists. Historical and current trends in content and methodology.
Prerequisite: PSYC200.

PSYC433 Basic Helping Skills: Research and Practice (4 Credits)
Theories and research regarding effective helping relationships, with a focus on applications to counseling and psychotherapy. Students will practice helping skills with each other and will conduct research projects evaluating their helping skills. Students should be willing to talk about personal issues in class. Attendance in labs is mandatory and contributes to the course grade; thus, students should only enroll in a lab section that they will be able to attend consistently.
Prerequisite: PSYC300.
Restriction: Must be in Psychology program; and must have earned a minimum of 85 credits; and must not have completed or be concurrently enrolled in EDCP 310.
Credit Only Granted for: EDCP210, EDCP310, or PSYC433.

PSYC435 Temperament, Personality, and Psychopathology (3 Credits)
An advanced review of cutting-edge research in humans and animals aimed at understanding the psychological and biological mechanisms underlying stable individual differences in temperament and personality (T&P) and determining their role in adult and child psychopathology, with a major focus on anxiety disorders, depression, and addiction. We will discuss the developmental origins of T&P, measurement issues, fundamental dimensions, heritability, relevance to psychopathology and intervention (treatment and prevention), and broader implications for public policy.
Prerequisite: PSYC200.

PSYC436 Introduction to Clinical Psychology: From Science to Practice (3 Credits)
Critical analysis of clinical psychology, with particular emphasis on current developments and trends.
Prerequisite: PSYC300.

PSYC437 The Assessment and Treatment of Addictive Behaviors (3 Credits)
Explores the current research in assessment and treatment of addictive behaviors. Topics may include addictions in the areas of alcohol, drugs, nicotine, gambling, and eating.
Prerequisite: PSYC100; and 9 credits in PSYC courses.

PSYC438 Special Topics in Study Abroad IV (1-6 Credits)
Special topics course taken as part of an approved study abroad program.
Repeatable to: 15 credits if content differs.

PSYC440 Experimental Psychology: Cognitive Processes and Legal Applications (4 Credits)
A survey of the content, models, and methods in cognitive psychology with an emphasis on attention and encoding, recall, recognition, judgment, signal detection theory, and applying cognitive theories to situations in the legal system. Students integrate scientific theories with real-life legal situations. Course topics include research methodology in assessing and addressing cognitive mechanisms and how this understanding may help eyewitness and victim recall and recognition, perpetrator recall, assessing scientific theories of repression, and real life examples.
Prerequisite: PSYC100, PSYC200, PSYC300 and PSYC341.
Restriction: Must be in Psychology program or Social Data Science - Psychology Track; and must have earned a minimum of 85 credits.

PSYC442 Psychology of Language (3 Credits)
Introductory survey of the psychology of language, focusing on the cognitive processes that enable us to produce and understand language. Topics include speech perception, speech production, syntactic processing, language development, language disorders, and the brain bases of language.
Prerequisite: PSYC300 and PSYC341.
Restriction: Must be in Psychology program.

PSYC447 Diversity in Organizations (3 Credits)
Overview and active discussion of issues related to diversity and discrimination in organizations from several different perspectives, including: the person(s) being stigmatized, the person(s) doing the stigmatizing, the bystander(s) witnessing stigmatization of others, and the organization. Course readings address each of these perspectives, along with an introductory unit that outlines key concepts of diversity.
Prerequisite: PSYC300.
Credit Only Granted for: PSYC489E or PSYC447.
Formerly: PSYC489E.

PSYC450 Applying Psychology to the Workplace: Industrial Organizational Psychology Laboratory (4 Credits)
In this laboratory course, students use data analytic techniques, along with psychology theories and principles, to solve problems and provide recommendations to mock organizations. Along with learning theories in industrial-organizational psychology and statistical analysis, students will improve personal presentation skills that promote effective communication of information.
Prerequisite: PSYC300.

PSYC460 Psychological Foundations of Personnel Selection and Training (3 Credits)
An examination of issues and processes involved in the design and evaluation of personnel selection and training programs in a variety of organizational settings: job, person and organizational analysis; organizational choice; development of predictors; evaluation of instructional and training systems; criteria for performance evaluation, promotion and training.
Prerequisite: PSYC361 and PSYC200.

PSYC464 Psychology of Leaders in Work Organizations (3 Credits)
The psychological assumptions and implications of various theories of management and leadership. Selections and training; development of careers; influence processes; change of managerial behavior; and the impact of the larger environment, nature of product or service, and organization structure on managerial behavior.
Prerequisite: PSYC200 and PSYC361.

PSYC468 Field Experience and Special Assignments in Honors (1-3 Credits)
An individual experience arranged by the honors student and his or her supervisor. A proposal submitted to the honors faculty in the semester preceding registration for the course should state the activities anticipated and the method of evaluation.
Prerequisite: Must have permission of supervisor and honors faculty.
Restriction: Permission of BSOS-Psychology department.
Repeatable to: 6 credits.

PSYC469 Honors Thesis Proposal Preparation (3 Credits)
Development of honors thesis proposal by preliminary research and literature review. Presentation of formal proposal to the thesis committee.
Restriction: Permission of BSOS-Psychology department.
Repeatable to: 3 credits.

PSYC478 Independent Study in Psychology (1-3 Credits)
Course credit related to independent study (IS) activity within the Department of Psychology, such as serving as a Teaching Assistant (TA) for a faculty member or graduate student.
Restriction: Permission of BSOS-Psychology department; and must have earned a minimum of 9 credits in Psychology; and must have earned a minimum GPA of 3.0 in Psychology; and minimum cumulative GPA of 2.8.
Repeatable to: 12 credits.

PSYC479 Special Research Problems in Psychology (1-3 Credits)
Course credit related to supervised research activity within the Department of Psychology, such as working as a Research Assistant (RA) for a faculty member or graduate student.
Restriction: Permission of BSOS-Psychology department; and must have earned a minimum of 9 credits in Psychology; and must have earned a minimum GPA of 3.0 in Psychology; and minimum cumulative GPA of 2.8.
Repeatable to: 12 credits.

PSYC488 Advanced Psychology I (Honors) (3 Credits)
Seminar covering topics in sensation, perception, learning, and motivation.
Prerequisite: PSYC200.
Restriction: Permission of BSOS-Psychology department.

PSYC489 Advanced Special Topics in Psychology (3 Credits)
Treatment of a specialized topic in psychology.
Prerequisite: PSYC300.
Repeatable to: 9 credits if content differs.

PSYC498 Advanced Psychology II (Honors) (1 Credit)
Seminar covering topics of current interest in psychology.
Prerequisite: Permission of BSOS-Psychology department.
Repeatable to: 3 credits.

PSYC499 Honors Thesis Research (3 Credits)
Prerequisite: PSYC469; and must have permission of thesis advisor.

QMMS - Quantitative Methodology: Measurement and Statistics

QMMS410 Classroom Assessment (3 Credits)
Developing and using classroom assessments, including tests, performance assessments, rating scales, portfolios, observations and oral interactions; basic psychometric statistics; standard setting; grading; communicating assessment information; testing ethics; locating and evaluating measures; program evaluation and classroom research; assessments used for educational policy decisions.
Restriction: Junior standing or higher.
Formerly: EDMS410.

QMMS451 Applied Educational Statistics (3 Credits)
Introduction to statistical reasoning; location and dispersion measures; data analysis; regression and correlation; formation of hypotheses tests;
Restriction: Sophomore standing or higher.
Credit Only Granted for: EDMS451 or QMMS451.
Formerly: EDMS451.

QMMS489 Field Experiences in Measurement and Statistics (1-4 Credits)
Planned field experience in education-related activities. Credit not to be granted for experiences accrued prior to registration.
Restriction: Permission of EDUC-Human Development and Quantitative Methodology department.
Repeatable to: 4 credits.

QMMS498 Special Problems in Measurement and Statistics (1-3 Credits)
Available only to education majors who have formal plans for individual study of approved problems.
Restriction: Permission of EDUC-Human Development and Quantitative Methodology department.
Repeatable to: 6 credits.

RDEV - Real Estate Development

RDEV250 People, Planet, and Profit: Building Sustainable Places (3 Credits)
An introduction to the four disciplines represented in the School: architecture and urban design, community planning, historic preservation, and real estate development, that work to create a more sustainable environment for the future to create a more sustainable environment for the future using our interpretation of the quadruple bottom line: socio-cultural, economic, environmental, and design sustainability. Students will be provided with an understanding of the fundamental scholarship and processes of each of these disciplines and examine the intersections between them. Additionally, they will learn by applying the approaches of the four disciplines through a series of field studies.
Cross-listed with: ARCH271.
Credit Only Granted for: ARCH271 or RDEV250.

RDEV270 Tax and Accounting for Real Estate Development (3 Credits)
An understanding of key tax and accounting principles and how they impact real estate development for students in the minor in real estate development is the purpose of this course. This course is geared for science, arts and humanities students who otherwise in their major would not take an accounting course as part of their major.
Restriction: Must be in the Real Estate and the Built Environment Major or the Real Estate Development minor; and must have permission of ARCH-Real Estate Development; and must not be in a major in the Robert H. Smith School of Business; and must not have completed BMGT210, BMGT220, or BMGT221.

RDEV350 Real Estate Development: Introduction to Principles, Process, and Practice (3 Credits)
An introduction to the basic principles of real estate development: How real estate and communities get built and how value is created. The emphasis is on entrepreneurship and an experiential learning approach to the entrepreneurial real estate development process, principles, and practice.
Prerequisite: RDEV250 or ARCH271.
Restriction: Must be in the Real Estate and the Built Environment major or the Real Estate Development minor; and permission of ARCH-School of Architecture, Planning, & Preservation.

RDEV410 Legal Foundations of Real Estate (3 Credits)
Provides students with the chance to explore various legal topics related to real estate, including government regulation, rights of property owners, financing real estate purchases, protections for certain classes of people, elements of a real estate contract, title, insurance, taxation, rights of landlords and tenants, premises liability, urban planning, land use regulation, and environmental issues.
Prerequisite: RDEV250 and RDEV350.
Restriction: Must be in the Real Estate and the Built Environment major; and permission of ARCH-Real Estate Development; and must have earned a minimum 60 credits.

RDEV415 Principles, Process and Politics of Planning for Real Estate Development (3 Credits)
Designed to introduce and familiarize students with planning and zoning and the associated processes and requirements that impact the real property development process and products. It will look at the roles the community and politics play in shaping the built environment and the development process.
Prerequisite: RDEV250 and RDEV350.
Restriction: Must be in the Real Estate and Built Environment major; and permission of ARCH-Real Estate Development; and must have earned a minimum 60 credits.

RDEV440 Principles of Urban Design for Real Estate Professionals (3 Credits)
Introduces students to the design issues associated with development of the basic real property asset classes (office, retail, and residential) and the context driven forces that shape these different development types. Also introduces non-design students to the principles of visual literacy and the capacity of different property to support development in the effort to enhance a community.
Prerequisite: RDEV250 and RDEV350.
Restriction: Must be in Real Estate and Built Environment Major; and permission of ARCH-Real Estate Development.

RDEV445 Essentials of Architectural Design and Construction Management for Real Estate Professionals (3 Credits)
Essential terminology, process and substantive knowledge needed by development professionals to effectively move a project through the design and construction process; includes environmental and ethical considerations throughout the process.
Restriction: Must be in the Real Estate and the Built Environment major; and permission of ARCH-Real Estate Development.

RDEV450 Foundations of Real Estate Finance and Investment (3 Credits)
Real Estate Finance and Investment addresses how real estate value is established, the fundamental foundations of the time value of money, as well as more real estate specific applications of return on investment, net operating income, the components of a real estate sources and uses statement, sources of real estate equity and debt financing, commonly used debt ratios and equity returns in real estate, as well as concepts of sensitivity analysis and exit strategies.
Prerequisite: Must have completed RDEV270 or an approved accounting course with a grade of C- or better; and minimum grade of C- in RDEV350.
Restriction: Must be enrolled in RDEV Minor; and permission of ARCH-School of Architecture, Planning, & Preservation.

RDEV470 Real Estate Development Case Studies (3 Credits)
Real Estate Development Case Studies takes the principles learned in RDEV 250, 350 and 450 and takes an in depth look at a selection of local, national and international case studies in residential, commercial office, retail and hospital and critically analyzes the success and failure, short term and long term of the projects.
Prerequisite: RDEV450.
Restriction: Must be in the Real Estate and the Built Environment major or Real Estate Development minor; and permission of ARCH-Real Estate Development.

RDEV473 Real Estate Case Study Competition (3 Credits)
The Colvin Institute of Real Estate Development hosts a case study competition. The Colvin Case Study Challenge is a national intercollegiate real estate case study competition for full or part-time students enrolled in a college or a university real estate program (undergraduate or graduate or a university sanctioned real estate club/organization). The Challenge is to document a recent innovative real estate project within the team's metropolitan region. Unlike many other case competitions, this is a post-development report and documentation of a recently completed project (or project phase). The Challenge is designed to hone professional skills and reveal the knowledge base and understanding of markets, project valuation, finance, urban design and sustainability, entitlement processes and operational issues. This course prepares students to participate in the competition.
Prerequisite: RDEV250, RDEV350, and RDEV450.
Restriction: Must be in the Real Estate and the Built Environment major; and permission of ARCH-Real Estate Development.

RDEV478 Special Topics in Real Property Development (1-3 Credits)
RDEV 478 will address one or more current topics in real property with a focus in one or more of the areas of real estate development from planning and entitlements, to design and construction, to market analysis and valuation, to finance and investment, to operations and property management, or social and economic impacts.
Recommended: RDEV250, RDEV350, and RDEV450.
Restriction: Permission of ARCH-School of Architecture, Planning, & Preservation.
Repeatable to: 6 credits if content differs.

RELS - Religious Studies

RELS120 Islamic Civilization (3 Credits)
Introduction to society and culture in the Middle East since the advent of Islam: as a personal and communal faith; as artistic and literary highlights of intellectual and cultural life; and as the interplay between politics and religion under the major Islamic regimes.
Cross-listed with: HIST120.
Credit Only Granted for: HIST120 or RELS120.

RELS133 God Wills It! The Crusades in Medieval and Modern Perspectives (3 Credits)
An examination of the identities and convictions both of the Western Europeans who participated in the Crusades and of the Easterners (Muslim, Christian, and Jewish) whom they encountered in the Holy Land. Focuses on the era of the first four great Crusades, from about 1095 to 1215. Consideration of the cultural impact of these movements on both Western Europe and the Middle East.
Cross-listed with: HIST133.
Credit Only Granted for: HIST133, RELS133 or RELS289D.
Formerly: RELS289D.

RELS170 Ancient Myths and Modern Lives (3 Credits)
What are myths and why do we tell them? What powers do myths have? We will tackle these questions by looking at the enduring and fascinating myths from ancient Greece and Rome. In addition to studying how they shaped ancient societies, we will also look at their modern influence and reflect upon the power that myths still hold in our contemporary world. Taught in English.
Cross-listed with: CLAS170.
Credit Only Granted for: CLAS170 or RELS170.
Additional Information: This course cannot be taken for language credit.

RELS171 Is Judaism a Religion? (3 Credits)
Jewish identity can be framed in terms of ethnicity, culture, and religious practice, but also in terms of more contemporary social constructions including social action, political engagement, and intellectual pursuit. In the context of such diverse social and individual frames, what does it mean to identify Judaism as a religion? Attention to Jewish society in historical and global perspective will provide a backdrop for a particular focus on contemporary Jews in the United States and Israel.
Cross-listed with: JWST171.
Credit Only Granted for: JWST171 or RELS171.

RELS219 Special Topics in Religious Studies (3 Credits)
Special topics in Religious Studies
Repeatable to: 9 credits if content differs.

RELS219K Reformers, Radicals, and Revolutionaries: The Middle East in the Twentieth Century (3 Credits)
The 20th century was a period of dramatic changes in the Middle East. Within the global context of the two World Wars and the Cold War, countries in the region struggled with the effects of colonialism and painful processes of decolonization. The course offers a thematic-comparative approach to issues such as social and political reform, nationalism, the colonial experience, independence struggles, models of governance, political violence, and Islamism. Course lectures and the analysis and discussion of primary sources will lead students to understand that the peoples of the Middle East found answers to the challenges posed by Western dominance based on their specific historical, cultural and socio-economic circumstances.
Cross-listed with: HIST245.
Credit Only Granted for: RELS219K or HIST245.

RELS225 Religions of the Ancient Near East (3 Credits)
Introduction to ancient Near Eastern religious systems and mythology, from the third millennium BCE through the fourth century BCE. Particular emphasis on Mesopotamia and ancient Israel.
Cross-listed with: HIST219I, JWST225.
Credit Only Granted for: JWST225, HIST219I, RELS225, or RELS219A.
Formerly: RELS219A.

RELS230 Inventing Traditions: The Making of Rabbinic Judaism (3 Credits)
Introduces the dramatic literary and cultural (as well as political and demographic) innovations that reshaped Judaism in late antiquity. Examines the fundamental works and genres of rabbinic literature and the religious movement that produced them. Special emphasis on the rabbinic uses of "tradition" to enhance authority and legitimacy, and to foster group identity.
Cross-listed with: HIST281, JWST230.
Credit Only Granted for: HIST281, JWST230, RELS219C or RELS230.
Formerly: RELS219C.

RELS236 Philosophy of Religion (3 Credits)
A philosophical study of some of the main problems of religious thought: the nature of religious experience, the justification of religious belief, the conflicting claims of religion and science, and the relation between religion and morality.
Cross-listed with: PHIL236.
Credit Only Granted for: PHIL236 or RELS236.

RELS250 Fundamental Concepts of Judaism (3 Credits)
A conceptional introduction to Judaism, analyzing its fundamental concepts from both analytical and historical perspectives. Discussion of "normative" Judaism as well as other conceptions of Judaism. Topics include: God, the Jewish people, authority, ethics, the sacred and the profane, particularism and universalism.
Cross-listed with: JWST250, PHIL234.
Credit Only Granted for: JWST250, PHIL234, or RELS250.

RELS264 Introduction to the New Testament (3 Credits)
A historical and literary introduction to the New Testament focusing on the context of the authors and the development of earliest Christianity.

RELS269 Special Topics in Study Abroad II (1-6 Credits)
Special topics course taken as part of an approved study abroad program.
Repeatable to: 15 credits if content differs.

RELS271 What is Religion? (3 Credits)
Draws upon examples from a wide variety of religious traditions to explore the question of what religion is and how to best understand it. Engagement with diverse approaches to religion including phenomenology and the study of "the sacred"; sociology and the study of religious communities; and questions of religious experience, ritual, and identity formation.
Credit Only Granted for: RELS289I or RELS271.
Formerly: RELS289I.

RELS273 Jesus, Mani, and Muhammad: The Dynamics of New Religious Movements (3 Credits)
We examine three significant ancient religious figures: Jesus (d. 30s CE), Mani (d. 276 CE), and Muhammad (d. 632). All three were founders of long-lasting religions that were part of a dramatic change in the society and religion of the ancient world. Special areas of focus: the biographies of these founding figures, and how we know them; a historical approach to religious founders; and the sociology of new religious movements.
Cross-listed with: HIST289T.
Credit Only Granted for: RELS273 or RELS289M or HIST289T.
Formerly: RELS289M.

RELS274 Jerusalem in Antiquity: The History of Sacred Space in a Holy City (3 Credits)
Examines the complex history of Jerusalem's status as a holy city, with a focus on constructions of sacred space in Judaism, Christianity, and Islam.
Cross-listed with: JWST274.
Credit Only Granted for: JWST274, RELS274, JWST289J or RELS289J.
Formerly: JWST289J, RELS289J.

RELS289 New Explorations in Religious Studies (3 Credits)
Investigation of critical and innovative responses in Religious Studies. Although the topic will vary, the course will encourage intellectual exploration by students of fundamental problems and critical methods.

RELS289C Jews, Christians, and Muslims in Medieval Spain: Tolerance, Oppression, and the Problematic Past (3 Credits)
For 800 years, medieval Spain was home to one of the most religiously diverse societies in European history. Despite frequent hostilities, the interactions of Spanish Jews, Christians, and Muslims produced a flowering of science, theology, and literature in an often remarkably tolerant climate. Students will learn how medieval Spanish people themselves experienced interreligious contact and conflict. They will also discover the modern pressures, prejudices, and ideals that have shaped historians interpretations of medieval Spain.
Cross-listed with: HIST289A.
Credit Only Granted for: HIST289A or RELS289C.

RELS319 Special Topics in Religious Studies (1-3 Credits)
Special topics in the study of religious history, literature, culture, and thought.
Repeatable to: 6 credits if content differs.

RELS340 Europe in the Making: The Early Medieval West (A.D. 300-1000) (3 Credits)
From one empire to another. Rome to Charlemagne. This period is approached as a crucible in which classical, Christian, and Germanic elements merged, yielding new experimental syntheses. This course will deal with issues of authority, cultural trends, and the formation of group solidarity.
Cross-listed with: HIST330.
Credit Only Granted for: HIST330 or RELS340.

RELS341 Europe in the High Middle Ages: 1000-1500 (3 Credits)
Medieval civilization in the 11th through 15th centuries. Emphasis on cultural and political developments of the high Middle Ages with study of the principal sources of medieval thought and learning, art and architecture, and political theory prior to the Renaissance.
Cross-listed with: HIST331.
Credit Only Granted for: HIST331 or RELS341.

RELS342 Renaissance Europe (3 Credits)
Intellectual developments in Italy and Northern Europe from 1300 to 1550 and their influence on the arts and religion; social and economic trends, including the rise of the commercial economy in cities; the family and the role of women in society; expansion of Europe overseas and the beginnings of colonization; emergence of the state and consequent changes in political theory.
Cross-listed with: HIST332.
Credit Only Granted for: HIST332 or RELS342.

RELS343 The European Reformations (3 Credits)
Examination of developments in European religion between 1450 and 1700; the late-medieval Church and its critics; rise of Protestant thought in Germany and its spread throughout Europe; reform efforts in the Catholic Church; religious wars and violence and their impact on state and society; consequences of religious reform in society and its impact on the family and women.
Cross-listed with: HIST333.
Credit Only Granted for: HIST333 or RELS343.

RELS346 History of Religion in America (3 Credits)
A history of religion, religious movements, and churches in America from the early Colonial period to the present, with special attention to the relation between church and society.
Cross-listed with: HIST306.
Credit Only Granted for: HIST306 or RELS346.

RELS347 Tradition and Change: Jewish Religion in the Modern World (3 Credits)
An exploration of the history of the different modern Jewish religious movements that developed in Europe, starting with messianic movements and ending with Reform and Orthodoxy. Emphasis will be placed on the influence of the academic study of Judaism on the development of modern Jewish religious ideologies and practices.
Cross-listed with: JWST347, HIST429X.
Credit Only Granted for: RELS347, JWST347, HIST429X, or RELS419R.
Formerly: RELS419R.

RELS369 Special Topics in Study Abroad III (1-6 Credits)
Special topics course taken as part of an approved study abroad program.
Repeatable to: 15 credits if content differs.

RELS370 Ancient Greek Religion: Gods, Myths, Temples (3 Credits)
Survey of Greek religious ideas and practices as they evolve from the Bronze Age to the early Christian period.
Cross-listed with: CLAS330.
Credit Only Granted for: CLAS330 or RELS370.

RELS408 Capstone Seminar for Religions of the Ancient Middle East (3 Credits)
A capstone seminar for majors in Religions of the Ancient Middle East, designed to provide the intellectual framework for a substantial, interdisciplinary research project. Course topics will be thematic and students will be encouraged to explore comparative or interdisciplinary approaches.
Repeatable to: 6 credits if content differs.

RELS419 Advanced Topics in Religious Studies (3 Credits)
The contemporary study of religion in which topics may address specific religious traditions, regional or historical developments, or methodological and theoretical issues.
Recommended: RELS216.
Repeatable to: 9 credits if content differs.

RELS427 The Epic of Gilgamesh (3 Credits)
One of the most famous tales from the ancient world, the Epic of Gilgamesh inspires readers with tales of friendship and loss, mortality, and the search for meaning. The story itself grew and changed over time and took on new meanings. Through study of the epic, its development over time, and the sources it drew from, this class will examine the meaning of the Gilgamesh epic and its impact on ancient Mesopotamian culture.
Prerequisite: JWST225, RELS225, HIST219I, or permission of the instructor.
Recommended: JWST262, ENGL262, or HEBR298B.
Cross-listed with: JWST427.
Credit Only Granted for: JWST419G, RELS419G, RELS427 or JWST427.
Formerly: JWST419G.

RELS429 Advanced Topics in Religious History (3 Credits)
Advanced study of religious history in a particular setting, with attention to particular themes, texts, events, or communities.
Recommended: RELS216 or RELS289.
Repeatable to: 9 credits if content differs.

RELS430 Dead Sea Scrolls (3 Credits)
A study of the Dead Sea Scrolls in their ancient and modern settings, and in terms of contemporary scholarly interpretations of their meaning. Interpretations of the historical significance of these documents, their connections to ancient Jewish sectarian movements, and their implications for our understanding of Judaism, Christianity, and the history of the Bible.
Prerequisite: Must have completed one JWST course or one RELS course; or permission of ARHU-Meyerhoff Program & Center for Jewish Studies. Cross-listed with JWST430.
Credit Only Granted for: JWST430 or RELS430.

RELS439 Advanced Topics in Religious Thought (3 Credits)
Advanced study of religious thought in a particular setting, with attention to particular themes, texts, events, or communities.
Recommended: RELS216 or RELS289.
Repeatable to: 9 credits if content differs.

RELS488 Honors Thesis Research in Religions of the Ancient Middle East (3 Credits)
Guided research on a thesis under the supervision of a faculty mentor.
Repeatable to: 6 credits if content differs.

RELS499 Independent Study in Religious Studies (1-3 Credits)
An advanced independent research project for qualified students, supervised by a faculty member, on a topic not ordinarily covered in available courses.
Prerequisite: Permission of ARHU-Meyerhoff Program & Center for Jewish Studies.
Repeatable to: 6 credits if content differs.

RELX - Religious Studies Education Abroad

RELX101 Religion in a Pluralistic World (3 Credits)
Examines the issue of religious pluralism, explores the relationship between religious truth and (in)tolerance, and examines how different religious traditions treat religious truth claims in regard to the social and political context in which they operate. Examines the interferences between the religious and the socio-political realm, both historically and in the context of the contemporary world.
Credit Only Granted for: RELS269F or RELX101.
Formerly: RELS269F.
Additional Information: This course is offered as part of the Maryland-in-Rome study abroad program. Students must apply for this program through Education Abroad: More information at ter.ps/UMRome. Education Abroad processes registrations for this course on behalf of students.

RUSS - Russian

RUSS101 Intensive Elementary Russian I (6 Credits)
This intensive first-year course is intended to develop the four skills: reading, writing, listening and speaking with an emphasis on communicative competence.
Prerequisite: Must have appropriate World Language Placement (WLP) score.

RUSS102 Intensive Elementary Russian II (6 Credits)
A continuation of RUSS101 which will further develop the four skills: reading, writing, listening and speaking with an emphasis on communicative competence.
Prerequisite: RUSS101 or must have appropriate World Language Placement (WLP) score; or students who have taken courses with comparable content may contact the department.

RUSS201 Intermediate Russian I (5 Credits)
Continued activation and expansion of skills and knowledge acquired in an elementary Russian course with the goal of communicative competence.
Prerequisite: RUSS102; or must have appropriate World Language Placement (WLP) score; or students who have taken courses with comparable content may contact the department.

RUSS202 Intermediate Russian II (5 Credits)
Continued activation and expansion of skills and knowledge acquired in RUSS201 with the goal of communicative competence.
Prerequisite: RUSS201; or must have appropriate World Language Placement (WLP) score; or students who have taken courses with comparable content may contact the department.

RUSS211 Applied Russian Phonetics (3 Credits)
Pronunciation; the sounds and intonational patterns of Russian in contrast with those of English.
Prerequisite: RUSS102.
Restriction: Must not be a native/fluent speaker of Russian.

RUSS223 Dostoevsky and The Russian Soul (3 Credits)
Dostoevsky's exploration of the dark side of the psyche shaped a mythological image of the Russian soul. An examination of his selected works in light of development of psychoanalysis and Russian and European intellectual history. Taught in English.

RUSS269 Special Topics in Study Abroad II (1-6 Credits)
Special topics course taken as part of an approved study abroad program.
Repeatable to: 15 credits if content differs.

RUSS281 Russian Language and Pre-Revolutionary Culture (3 Credits)
Introduction to the Russian language and a study of Russian nationalism; artistic and social concepts in the development of Russian art, dance, geography, history and literature from the 18th to the 20th centuries. Lectures in English, with third hour devoted to basic language instruction (alphabet, vocabulary, pronunciation and minimal conversational skills).
Restriction: Must not be a native/fluent speaker of Russian.

RUSS287 The Power of the Word: Freedom of Speech in the U.S. and Russia (3 Credits)
The central theme is the abiding human propensity to ask questions, to use language to pursue inquiry. To be a "critical thinker," one must develop the habit and discipline of asking questions and challenging assumptions. Through a comparative approach to the US and Russian experiences, we will explore the role of language and its power in different political and social systems. We will explore such questions as: Why is free speech so fiercely defended in a democracy and such a threat to totalitarianism? What is the relationship between free speech, political power and dissent? Is the pen still mightier than the sword, even in the nuclear age? What has shaped our current attitudes toward freedom of expression? How has the concept of political free speech been extended to include freedom of expression in general, such as in the creative arts? What role do new technologies play in the arena of free speech debates? We will explore how freedom of speech and expression has been defended or its suppression justified in the US and Russia. We will practice the art of questioning and constructing counter-arguments throughout the course.
Credit Only Granted for: RUSS287 or RUSS289I.
Formerly: RUSS289I.
Additional Information: Taught in English.

RUSS298 Special Topics in Russian Language and Literature (3 Credits)
Repeatable to: 6 credits if content differs.

RUSS301 Advanced Russian I (3 Credits)
Advanced training in written Russian communicative structures.
Prerequisite: RUSS202; or students who have taken courses with comparable content may contact the department.

RUSS302 Advanced Russian II (3 Credits)
Advanced training in written Russian communicative structures.
Prerequisite: RUSS301; or students who have taken courses with comparable content may contact the department.

RUSS303 Russian Conversation: Functional Skills (3 Credits)
Intended for students who do not anticipate having the opportunity to study in Russia. Skills for daily life (both function and etiquette) and argumentation (rhetoric).
Prerequisite: RUSS202; or students who have taken courses with comparable content may contact the department.

RUSS321 Survey of Russian Literature I (3 Credits)
The first half of a survey of Russian literature.
Prerequisite: RUSS202; or students who have taken courses with comparable content may contact the department.

RUSS328 19th Century Russian Literature in Translation (3 Credits)
Development of Russian literary thought in the Russian novel and short prose of the 19th century. Influence of western literatures and philosophies.
Repeatable to: 6 credits if content differs.

RUSS329 Soviet Literature in Translation (3 Credits)
Russian literature between 1917 and the fall of the Soviet Union, both as a continuation of pre-revolutionary traditions and as a reflection of Soviet ideology.
Repeatable to: 6 credits if content differs.

RUSS334 Soviet Film: Propaganda, Myth, Modernism (3 Credits)
A Survey of Soviet film from the 1920s to 1991, focusing on important directors, genres, themes, and styles. Taught in English.
Cross-listed with: CINE334.
Credit Only Granted for: RUSS334, CINE334, or FILM334.
Formerly: FILM334.

RUSS336 Soviet Cinema and Empire (3 Credits)
Examination of the concepts of "empire" and "nation" through their representation in Soviet cinema. Taught in English.
Cross-listed with: CINE336.
Credit Only Granted for: RUSS336, CINE336, or FILM336.
Formerly: FILM336.

RUSS341 Museums, Masterworks, and Memes: Russian through Art (3 Credits)
Examines the visual cultures of the Russian-speaking world from the 18th century to the present, focusing on major artists and artworks in their historical, cultural, and sociopolitical contexts. Emphasizes development of Russian language skills through discussion, analysis, and creative engagement. Taught in Russian.
Prerequisite: Must have completed RUSS202 or have equivalent proficiency at the Intermediate level, by permission of instructor.
Credit Only Granted for: RUSS341, RUSS398V, or RUSS439V.
Formerly: RUSS439V, RUSS398V.

RUSS355 New Waves of the Soviet Bloc (3 Credits)
Considers the possibilities and challenges of cinema in a particular historical moment: the "new waves" of the "Soviet bloc" in the 1960s, from Poland, Czechoslovakia, Hungary, and Yugoslavia, to the Soviet Union itself, including the non-Russian republics. Taught in English.
Cross-listed with: CINE355.
Credit Only Granted for: CINE355, RUSS355, RUSS398D, CINE359O or FILM359O.
Formerly: CINE359O.

RUSS361 Dostoevsky's Life and Works (3 Credits)
A study of Dostoevsky's major works with reference to related developments in Russian and European culture, literary criticism, and intellectual history. Interdisciplinary investigation of Dostoevsky's contemporary relevance and tremendous international popularity.

RUSS369 Special Topics in Study Abroad III (1-6 Credits)
Special topics course taken as part of an approved study abroad program.
Repeatable to: 15 credits if content differs.

RUSS386 Experiential Learning (3-6 Credits)
Restriction: Junior standing or higher; and permission of ARHU-School of Languages, Literatures, and Cultures department.

RUSS388 Language House Spring Colloquium (1 Credit)
For students residing in the Language House Immersion Program. Focuses on the development of skills in the target language and acquiring the cultural knowledge of the countries that speak the target language.
Restriction: Must be a resident of Language House.
Repeatable to: 8 credits.

RUSS398 Selected Topics in Russian Language and Literature (3 Credits)
Repeatable to: 6 credits if content differs.

RUSS399 Directed Study in Russian (1-3 Credits)
For advanced students, by permission of department chairman. Course may be repeated for credit if content differs to a maximum of six hours.
Repeatable to: 6 credits.

RUSS401 Advanced Russian Composition (3 Credits)
Approaches to argumentation, organization of information, contextualized grammar, appropriateness of lexical choice, genre, and register.
Prerequisite: RUSS302; or students who have taken courses with comparable content may contact the department.

RUSS402 Practicum in Written Russian (3 Credits)
Designed to improve comprehension of functional varieties of written Russian and develop ability to present in written form concise syntheses of source texts.
Prerequisite: RUSS401; or students who have taken courses with comparable content may contact the department.

RUSS403 Russian Conversation: Advanced Skills (3 Credits)
Advanced spoken production of high-level, abstract language.
Prerequisite: Must have completed or be concurrently enrolled in RUSS301, or students who have taken courses with comparable content may contact the department.

RUSS404 Practicum in Spoken Russian (3 Credits)
To improve comprehension of rapidly spoken Russian of various functional styles and to develop ability to synthesize orally the content of spoken material.
Prerequisite: Must have completed or be concurrently enrolled in RUSS301, or students who have taken courses with comparable content may contact the department.

RUSS405 Russian-English Translation I (3 Credits)
Introduction to the principles of translation of a particular genre, and is typically diplomatic, business, or literary.
Prerequisite: Must have completed or be concurrently enrolled in RUSS302.

RUSS409 Selected Topics in Russian Language Study (3 Credits)
Presentation of a topic in Russian language study.
Restriction: Permission of ARHU-School of Languages, Literatures, and Cultures department.
Repeatable to: 6 credits if content differs.

RUSS411 Linguistic Analysis of Russian I (3 Credits)
Elucidation of theoretical concepts of modern linguistics through the analysis of problematic concepts in the Russian linguistic system. Phonology and the syntax of the simple sentence.
Prerequisite: Must have completed or be concurrently enrolled in RUSS301.

RUSS439 Selected Topics in Russian Literature (3 Credits)
Presentation of a topic in Russian literature.
Restriction: Permission of ARHU-School of Languages, Literatures, and Cultures department.
Repeatable to: 6 credits if content differs.

RUSS499 Independent Study in Russian (1-3 Credits)
Independent study under faculty supervision.
Prerequisite: Permission of instructor.
Repeatable to: 6 credits if content differs.

SDSB - Social Data Science, BSOS

SDSB123 Social Data Science: Pathways and Applications (1 Credit)
Data Science, machine learning, and AI have exploded in popularity, and the big data revolution has affected how science is done in all fields, from the physical sciences to the behavioral and social sciences. This course explores the goals, values, skills, and practices of how data science is conducted within a variety of fields within the social sciences. It will enable students to identify questions and challenges that data science can address and help them find the data science discipline that matches their own values and goals.
Restriction: Must be in a major in the College of Behavioral and Social Sciences or the College of Information Studies; or permission of instructor.
Credit Only Granted for: BSOS188C or SDSB123.
Formerly: BSOS188C.

SDSB180 Introduction to Data Management (1 Credit)
Learn to read data, clean data sets, and perform other vital functions (mainly in Excel). Students will develop fundamental skills that will ease the transition into future coursework (or a career) in data science or analytics. Designed for students who have minimal background in Excel or computer software.
Restriction: Must be in a major within the College of Behavioral and Social Sciences or the College of Information.
Credit Only Granted for: SDSB180 or BSOS180.
Formerly: BSOS180.
Additional Information: Recommended for BSOS majors who need additional support for their disciplinary stats or research methods sequence.

SDSB233 Data Science for Social Science (3 Credits)
An introduction to modern methods of data analysis for social scientists. This course emphasizes teaching students who have no previous coding experience how to analyze data and extract meaning in a social science context. Students will gain critical programming skills and learn inferential thinking through examples and projects with real-world relevance.
Prerequisite: Must have completed or be concurrently enrolled in STAT100.
Restriction: Must be in a major in the College of Behavioral and Social Sciences or the College of Information Studies; or permission of instructor.
Credit Only Granted for: SDSB233 or BSOS233.

SDSB326 Python Programming for the Social Sciences (3 Credits)
Python has become an extremely powerful programming language in advanced statistics and data analytics. It includes expansive packages for data handling and processing, including the latest developments in machine learning, and offers Integrated Development Environments (IDE) for code development, testing, debugging, and graphical representation. This course offers a thorough introduction to Python and those packages that are fundamental to data processing and analysis.
Prerequisite: Minimum grade of C- in BSOS233 or SDSB233.
Restriction: Must be in a major in the College of Behavioral and Social Sciences or the College of Information Studies; or permission of instructor.
Credit Only Granted for: SDSB326 or BSOS326.
Formerly: BSOS326.

SDSB340 Introduction to Survey Methodology (3 Credits)
Introduces the student to a set of principles of survey and data science that are the basis of standard practices in these fields. The course exposes the student to key terminology and concepts of collecting and analyzing data from surveys and other data sources to gain insights and to test hypotheses about the nature of human and social behavior and interaction. It will also present a framework that will allow the student to evaluate the influence of different error sources on the quality of data.
Prerequisite: STAT100.
Restriction: Must be in a major in the College of Behavioral and Social Sciences or the College of Information Studies; or permission of instructor.
Credit Only Granted for: SURV400 or SDSB340.

SDSI - Social Data Science, INFO

SDSI414 Data Science Techniques (3 Credits)
An exploration of how to extract insights from large-scale datasets. The course will cover the complete analytical funnel from data extraction and cleaning to data analysis and insights interpretation and visualization. The data analysis component will focus on techniques in both supervised and unsupervised learning to extract information from datasets. Topics will include clustering, classification, and regression techniques. Through homework assignments, a project, exams and in-class activities, students will practice working with these techniques and tools to extract relevant information from structured and unstructured data.
Prerequisite: Minimum grade of C- in MATH115 (or higher) and STAT100; and a minimum grade of C- from INST126 or GEOG276; and a minimum grade of C- from one of the following (INST201, INST301, BSOS233, or SDSB233); and a minimum grade of C- from one of the following (AASP101, ANTH210, ANTH260, ECON200, ECON201, GEOG202, GVPT170, PSYC100, or SOCY100); and a minimum grade of C- from BSOS233 or INST314.
Recommended: Minimum C- in MATH140 and (INST326, BSOS326, or GEOG376).
Jointly offered with: INST414.
Restriction: Must be in Social Data Science program.
Credit Only Granted for: SDSI414 or INST414.

SDSI492 Integrated Capstone for Social Data Science (3 Credits)
The capstone provides a platform for Social Data Science students where they can apply a subset of the concepts, methods, and tools they learn as part of the SDSC program to address a problem in data science or information.
Prerequisite: Minimum grade of C- in BSOS326 or SDSB326, INST327, INST366, SURV400, INST462, and INST414 or SDSI414.
Jointly offered with: INST490, INST491.
Restriction: Must be in Social Data Science program; and must have earned a minimum of 90 credits; and permission of INFO-College of Information Studies.
Credit Only Granted for: INST490, INST491 or SDSI492.

SLAA - Second Language Acquisition and Application

SLAA269 Special Topics in Study Abroad II (1-6 Credits)
Special topics course taken as part of an approved study abroad program.
Repeatable to: 15 credits if content differs.

SLAA369 Special Topics in Study Abroad III (1-6 Credits)
Special topics course taken as part of an approved study abroad program.
Repeatable to: 15 credits if content differs.

SLAA498 Second Language Research and Practicum (1-3 Credits)
Individualized research and practicum for undergraduate students to work as Undergraduate Research Assistants (UGRA) on existing projects under the supervision of a PhD Graduate Supervisor (GS) in the area of second language acquisition to learn/experience how second language as well as psycholinguistic research is conducted.
Restriction: Permission of ARHU-School of Languages, Literatures, and Cultures department.
Repeatable to: 9 credits if content differs.
Additional Information: UGRAs register for 1-3 credits. A specific weekly schedule will be determined at the beginning of the semester. Throughout the semester, students will meet with the Graduate Supervisor (GS) once per week to discuss the theoretical and methodological background of the project as well as the broader area behind the research. In addition to the training in theoretical background, the first several weeks of the semester will be devoted to hands-on details of running subjects using a particular method and analyzing data. When this training is complete, UGRAs will work more independently to schedule and run research projects and process the data.

SLLC - School of Languages, Literatures and Cultures

SLLC108 Beg Less Commonly Taught Language I (3-6 Credits)
Study of any of the less commonly taught languages at the elementary level. Speaking, listening, reading, and writing a less commonly taught language. Development of an emphasis on oral proficiency skills.
Restriction: Not open to native speakers of the language being taught. Heritage speakers must contact the instructor at the host institution to determine proper placement.
Repeatable to: 12 credits if content differs.
Additional Information: Course is offered remotely via a member institution of the CIC CourseShare arrangement. Instruction may be delivered synchronously or asynchronously. Students register through University of Maryland, and course appears on transcript as a UMd course. No additional fees are associated with this course.

SLLC109 Beg Less Commonly Taught Language II (3-6 Credits)
Study of any of the less commonly taught languages at the elementary level, as a continuation of SLLC108 (in the same language). Speaking, listening, reading, and writing a less commonly taught language. Development of an emphasis on oral proficiency skills.
Restriction: Not open to native speakers of the language being taught. Heritage speakers, or those with previous experience in the language, must contact the instructor at the host institution to determine proper placement.
Repeatable to: 12 credits if content differs.
Additional Information: Course is offered remotely via a member institution of the CIC CourseShare arrangement. Instruction may be delivered synchronously or asynchronously. Students register through University of Maryland, and course appears on transcript as a UMd course. No additional fees are associated with this course.

SLLC169 Special Topics in Study Abroad I (1-6 Credits)
Special topics course taken as part of an approved study abroad program.
Repeatable to: 15 credits if content differs.

SLLC199 Special Topics in Language Study (1-3 Credits)
Language and topic to be announced when offered.
Repeatable to: 6 credits if content differs.

SLLC200 Global Movements (3 Credits)
This interdisciplinary and cross-cultural course introduces students to a variety of frameworks for understanding our interconnected world by focusing on one or more issues of global relevance today, including but not limited to conflict, revolution, and war; democracy, citizenship, and human rights; migration; and climate change. Focusing on the interpretive methods of the humanities, including critical analysis, close readings, and engagement with theoretical approaches, we will discuss the historical, social, and cultural contexts of major global movements in comparative perspective. In addition to examining literary, cultural, and media texts, the class will ask students to make connections between global and local contexts through a group service-learning project.

SLLC208 Intermediate Less Commonly Taught Language I (3-6 Credits)
Intermediate-level work on speaking, reading, and writing a less commonly taught language. Continued development of oral proficiency skills.
Prerequisite: SLLC109; or must have permission of instructor after placement assessment.
Restriction: Not open to fluent/native speakers. Heritage speakers or students with prior knowledge of the language must contact the instructor at the host institution to determine proper placement before enrolling.
Repeatable to: 12 credits if content differs.
Additional Information: Course is offered remotely via a member institution of the CIC CourseShare arrangement. Instruction may be delivered synchronously or asynchronously. Students register through University of Maryland, and course appears on transcript as a UMd course. No additional fees are associated with this course.

SLLC209 Intermediate Less Commonly Taught Language II (3-6 Credits)
Second semester Intermediate-level work on speaking, reading, and writing a less commonly taught language. Continued development of oral proficiency skills.
Prerequisite: Must have completed SLLC208 or have permission of instructor, based on placement assessment.
Restriction: Not open to native speakers of the language being taught. Heritage speakers or students with prior knowledge of the language must contact the instructor at the host institution to determine proper placement before enrolling.
Repeatable to: 12 credits if content differs.
Additional Information: Course is offered remotely via a member institution of the CIC CourseShare arrangement. Instruction may be delivered synchronously or asynchronously. Students register through University of Maryland, and course appears on transcript as a UMd course. No additional fees are associated with this course.

SLLC269 Special Topics in Study Abroad II (1-6 Credits)
Special topics course taken as part of an approved study abroad program.
Repeatable to: 15 credits if content differs.

SLLC280 Mythology of the Oppressed (3 Credits)
Does information drive human history? Mythological recurrences say much about cultures that had to adapt their world views while attempting to preserve them. This course examines the cognitive or social bases of mythology, to be pursued from insights in cultural and literary studies, linguistics, the cognitive sciences, paleo-anthropology, archeology, etc. The course is designed to help students think about complex problems from a humanistic perspective, making liberal use of the sciences.

SLLC286 Living the Good Life: Chinese Philosophy in the Modern World (3 Credits)
Confucius, Mencius, Zhuangzi and other Chinese thinkers who lived more than 2,000 years ago would argue that the contemporary Western emphasis on self-discovery (Find yourself) and self-acceptance has led you astray. See what they have to say and discuss what relevance it has for the modern world as we study how early Chinese thinkers wrestled with questions of existence, morality, and governance. No previous knowledge of Chinese philosophy and history will be assumed and no prerequisites are required. We will discuss ideas that are both historical and relevant to students' lives. What is "the Way"? How do we cultivate spontaneity? Is there a stable self? How can we be more alive? These are questions important for ancient kings but also for UMD students choosing a major, or wondering how ARHU can benefit them.
Additional Information: Taught in English.

SLLC290 Behavior of the Rich and Powerful, Past and Present (3 Credits)
Through the study of fifteenth- and sixteenth-century courtesy literature, in this course we explore the various forms of behavior of the rich and powerful of the Italian Renaissance, an era that is much closer to our contemporary world than we might initially think, especially in regard to the way political and influential figures act in social situations and the image of themselves they present to others. What can we learn from observing and comparing the behavior of the rich and powerful of the past and present? In the public arena of these two worlds, does appearance matter more than truth?
Restriction: Must be in the Freshmen Connection program.
Credit Only Granted for: SLLC290 OR SLLC299P.
Formerly: SLLC299P.
Additional Information: Taught in English.

SLLC299 Special Topics in World Cultures (1-6 Credits)
Topic to be announced when course is offered.
Repeatable to: 6 credits if content differs.

SLLC305 Language, Identity and Diversity in the U.S. (3 Credits)
Introduces issues of linguistic diversity in the framework of the U.S. as a multilingual society. Special emphasis is placed on attitudes toward language diversity, specifically, how regional, social, generational, ethnic, racial and gender differences in language use contribute to notions of identity.

SLLC309 Language Partner Program (1 Credit)
For intermediate- to advanced-level language study. Conversations entirely in target language with native speaker.
Prerequisite: Permission of ARHU-School of Languages, Literatures, and Cultures department.
Restriction: For intermediate- to advanced-level language majors.
Repeatable to: 3 credits.

SLLC329 Language House Immersion (1 Credit)
Provides credit for students participating in the Language House Living-Learning program. It focuses on the further development of skills in the target language and the acquisition of cultural knowledge of the countries and communities where people speak the target language. It requires hands-on immersive linguistic and cultural activities led by a native-speaking mentor and supplements the learning that takes place in the language classroom and in the living-learning environment of the Language House.
Restriction: Permission of the Language House Director and the related program Faculty Liaison; and must be in the Language House Immersion Program.
Repeatable to: 6 credits.

SLLC342 Film Comedy (3 Credits)
Comedy as a specific cinematic genre.
Prerequisite: ENGL245, FILM245, or CINE245; or permission of ARHU-School of Languages, Literatures, and Cultures department.
Cross-listed with: CINE342.
Credit Only Granted for: SLLC342, CINE342, or FILM342.
Formerly: FILM342.

SLLC344 Film and the Fantastic (3 Credits)
Survey of fantastic cinema, encompassing American classics, Hollywood recent productions, and independent films, as well as Asian horror films, anime, and European fantasy.
Prerequisite: ENGL245, FILM245, or CINE245; or permission of ARHU-School of Languages, Literatures, and Cultures department.
Cross-listed with: CINE344.
Credit Only Granted for: SLLC344, CINE344 or FILM344.
Formerly: FILM344.

SLLC350 Translation in a Global Context (3 Credits)
Provides a theoretical foundation for understanding the history, practice, and ethics of translation in a global context. Students will learn about key movements, theories, and debates in the field of translation studies, with a focus on scholarly readings that examine the role of language, literature, and culture in shaping perception and reality, and compare a variety of published translations in order to examine the role of translation in the negotiation and creation of meaning. A key facet of our readings and discussions will be a critical engagement with how global issues of power, violence, and resistance are intertwined with processes of translation. Students will be able to synthesize what they have learned by undertaking a translation project of their own, in consultation with the course instructor and faculty specialists in their language(s) of choice.
Prerequisite: Basic proficiency in at least one language other than English.
Recommended: SLLC200.
Restriction: Permission of the School of Languages, Literatures, and Cultures.

SLLC360 Cultural Theory in a Global Age (3 Credits)
Examines the need to think beyond established frameworks, including the national-cultural paradigm, for apprehending literature, cinema, and other forms of cultural production in a global age. We will read and discuss theories that respond to and engage with the increased flow of ideas, bodies, and texts in an era characterized by globalization, migration, and neoliberal capitalism. We will also analyze literary texts, films, and cultural movements that emerge from and address the geopolitical transformations and challenges of the present. Students are expected to address topics comparatively across different languages, as appropriate for their level of linguistic proficiency. The range of connections between language and cultural expression and understanding is a central topic of the course.
Prerequisite: SLLC200.

SLLC361 Cinema and Globalization (3 Credits)
Introduction to cinema as a global phenomenon.
Prerequisite: ENGL245, FILM245, or CINE245; or permission of Film Studies program; or permission of ARHU-School of Languages, Literatures, and Cultures department.
Cross-listed with: CINE361.
Credit Only Granted for: SLLC361, CINE361, or FILM361.
Formerly: FILM361.

SLLC362 Vision, Visuality, and the Gaze in Cinema (3 Credits)
Students will build a way of talking critically about film. The prism of seeing, visuality, the gaze, and the like will serve as a way to investigate the way films take on meaning as well as to understand how film participates in a wide network of interconnected ideas, concepts, and modes of thought that have contributed to the audiences' ability to make sense of what a film is conveying.
Prerequisite: ENGL245, FILM245 or CINE245; or permission of Film Studies Program; or permission of ARHU-School of Languages, Literatures, and Cultures department.
Cross-listed with: CINE362.
Credit Only Granted for: SLLC362, CINE362, or FILM362.
Formerly: FILM362.

SLLC368 Special Topics in Film Studies I (3 Credits)
Content varies. Exploration of topics in film studies beyond national traditions, for example through the lens of theory, genre, auteurship, aesthetic movements in cinema, and/or comparative perspectives.

SLLC369 Special Topics in Study Abroad III (1-6 Credits)
Special topics course taken as part of an approved study abroad program.
Repeatable to: 15 credits if content differs.

SLLC386 Experiential Learning (3 Credits)
Prerequisite: Learning Proposal approved by the Office of Experiential Learning Programs, faculty sponsor and the student's internship sponsor.
Restriction: Junior standing or higher.

SLLC400 Articulatory Phonetics for Second Language Acquisition and Application (3 Credits)
The mechanical capabilities of the human vocal apparatus for producing speech sounds, and their terminology and transcription in the International Phonetic Alphabet. Emphasis is on the practical needs of the teacher and student of foreign language, rather than the theoretical linguist or the hearing-and-speech pathologist. The phonetics of major languages are also introduced, with attention to the pedagogy of their phonetics.
Restriction: Junior standing or higher.

SLLC410 Documentary and Narrative (3 Credits)
An examination of the relationship between film and reality, focusing on documentary film.
Prerequisite: ENGL245, FILM245, or CINE245; or permission of ARHU-School of Languages, Literatures, and Cultures department.
Cross-listed with: CINE410.
Credit Only Granted for: SLLC410, CINE410 or FILM410.
Formerly: FILM410.

SLLC411 Experimental Film (3 Credits)
Introductory survey of European and U.S. American experimental cinema.
Cross-listed with: CINE411.
Credit Only Granted for: SLLC411, CINE411 or FILM411.
Formerly: FILM411.

SLLC461 Political Cinema (3 Credits)
Histories of cinema and politics in the 20th century.
Prerequisite: ENGL245, FILM245, or CINE245; or permission of ARHU-School of Languages, Literatures, and Cultures department.
Cross-listed with: CINE461.
Credit Only Granted for: CINE461, FILM461 or SLLC461.
Formerly: FILM461.

SLLC463 Screening Time: History and Memory in Cinema (3 Credits)
An examination of the ways and techniques with which cinema produces a sense of time in the viewer.
Prerequisite: ENGL245, FILM245, or CINE245; or permission of ARHU-College of Arts & Humanities.
Cross-listed with: CINE463.
Credit Only Granted for: SLLC463, CINE463 or FILM463.
Formerly: FILM463.

SLLC468 Special Topics in Film Studies II (3 Credits)
Exploration of topics in film studies beyond national traditions, for example through the lens of theory, genre, auteurship, aesthetic movements in cinema, and/or comparative perspectives. Courses at the 400-level have higher expectations of independent work, including reading and written assignments.
Repeatable to: 12 credits if content differs.

SLLC471 The Cultural Environment of Global Business (3 Credits)
The goal of this course is to provide students with an understanding of cultural aspects pertaining to global business, and thereby increasing their awareness of the cultural factors that motivate decisions and behavior in the business world. Students will gain an understanding of how the business cultures in the rest of the world diverge from the American, and develop the cultural understanding, attitudes, and communication skills needed to function appropriately within an increasingly global and multicultural working environment.
Restriction: Sophomore standing or higher.
Credit Only Granted for: ARHU439B, ARHU439E, ARHU439T, ENES472, SLLC471, or SLLC473.
Formerly: ARHU439B.

SLLC473 European Business Cultures (3 Credits)
The goal of this course is to provide students with an understanding of cultural aspects pertaining to European business, and thereby increasing their awareness of the cultural factors that motivate decisions and behavior in the European business world. Students will gain an understanding of how the European business cultures diverge from the American, and develop the cultural understanding, attitudes, and communication skills needed to function appropriately within an increasingly global and multicultural working environment.
Restriction: Sophomore standing or higher.
Credit Only Granted for: ARHU439B, ARHU439E, ARHU439T, ENES472, SLLC471, or SLLC473.
Formerly: ARHU439E.

SLLC499 Special Topics in World Cultures (3 Credits)
Interdisciplinary, transnational or cross-language course; specific topic to be announced.
Repeatable to: 12 credits if content differs.

SLLX - School of Languages, Literatures & Cultures Education Abroad

SLLX101 Swedish Language and Culture: Level 1 (3 Credits)
This course is an integrated language and culture course. When studying Swedish language, we will employ a functional approach. The course will focus on spoken everyday Swedish, reading comprehension and basic grammar. We will study different aspects of Swedish culture and we will operate with a complex view on culture through various representations. The focus will be on dominant national narratives, values, and symbolism, which we will approach from both a historical and contemporary perspective.
Additional Information: This course is offered as part of the Maryland-in-Stockholm study abroad program. Students must apply for this program through Education Abroad: More information at ter.ps/UMStockholm. Education Abroad processes registrations for this course on behalf of students.

SLLX102 Swedish Language and Culture: Levels 1 and 2 (6 Credits)
This intensive course covers two semesters of Swedish language content in one, making it an excellent option for students who wish to advance quickly in their knowledge of the language. The emphasis is on speaking, writing, and understanding basic Swedish language. Swedish literature, film, and music are included in the curriculum. Politics, burning cultural issues, and your personal experiences form the cornerstone of class discussions.
Additional Information: This course is offered as part of the Maryland-in-Stockholm study abroad program. Students must apply for this program through Education Abroad: More information at ter.ps/UMStockholm. Education Abroad processes registrations for this course on behalf of students.

SLLX103 Introduction to Catalan Language (3 Credits)
Introduces students to the Catalan language at an A1 level. Upon successful completion of this course, users are able to cope linguistically in a range of limited but basic survival situations that require a very predictable use of language.
Additional Information: This course is offered as part of the Maryland-in-Barcelona study abroad program. Students must apply for this program through Education Abroad: More information at ter.ps/UMBarcelona. Education Abroad processes registrations for this course on behalf of students.

SLLX106 Elementary Italian II (4 Credits)
Focuses on vocabulary expansion and strengthening the four language skills of speaking, listening, writing, and reading in order to provide students with the ability to converse on familiar social situations related to school, recreation, and particular interests. This course equips students to provide oral descriptions in the major time frames (past, present, and future), read short written texts, and write short compositions on familiar topics.
Credit Only Granted for: ITAL103 or SLLX106.
Formerly: ITAL103.
Additional Information: This course is offered as part of the Maryland-in-Rome study abroad program. Students must apply for this program through Education Abroad: More information at ter.ps/UMRome. Education Abroad processes registrations for this course on behalf of students.

SLLX200 Spanish Civilization and Culture (3 Credits)
This course starts with an extensive view of the Spanish history and then examines the different cultures within Spain: Castilian, Catalan, Basque and Galician; focusing mainly on language, nationality, and political implications. The rest of the course will travel throughout the various aspects of the Spanish Civilization, understanding civilization as lifestyle and society, and also the various artistic ways of expression. Taught in English.
Credit Only Granted for: SLLC299Z or SLLX200.
Additional Information: This course is offered as part of the Maryland-in-Barcelona study abroad program. Students must apply for this program through Education Abroad: More information at ter.ps/UMBarcelona. Education Abroad processes registrations for this course on behalf of students.

SLLX201 Swedish Language and Culture: Intermediate (3 Credits)
This class is intended to improve your linguistic and communicative skills in Swedish on an intermediate level. It is an integrated language and culture course, and it gives you the opportunity to reflect upon and document intercultural competences gained while studying abroad at DIS. The course makes you develop a critical and analytical understanding of your own as well as of the Swedish culture, and it seeks to explore Swedish history, literature, film, art as well as the burning issues of today - enriching your experience and making you a qualified discussion partner for your Swedish family and friends.
Additional Information: This course is offered as part of the Maryland-in-Stockholm study abroad program. Students must apply for this program through Education Abroad: More information at ter.ps/UMStockholm. Education Abroad processes registrations for this course on behalf of students.

SLLX202 Cultural Realities of Spain (1 Credit)
All educational experience abroad is a period of cultural adaptation that is complex and meaningful, and therefore worthy of deeper analysis. Aims to help the foreign student by guiding them through critical reflections that help with the adaptation and integration into Spanish culture. It is important to analyze Spanish reality in all its aspects: social, occupational, religious, economic, cultural and leisure activities to better understand changes and clashes that students may experience throughout their stay in Spain.
Additional Information: This course is offered as part of the Maryland-in-Sevilla study abroad program. Students must apply for this program through Education Abroad: More information at ter.ps/UMSevilla. Education Abroad processes registrations for this course on behalf of students.

SLLX204 Italian Fashion (3 Credits)
Examines the history of Italy's fashion industry in order to understand how it gained strength and importance in Italian culture. The course will analyze how fashion has been effective historically as a communication system that has represented the development of Italian national identity and in turn has had considerable impact on Italian society and culture. The course makes use of novels, periodicals and films from the late 19th century post-unification period to the present and will highlight the close connection between the massive presence of art in Italy and its influence on the development of a collective sense of aesthetics that finds confirmation in fashion.
Additional Information: This course is offered as part of the Maryland-in-Rome study abroad program. Students must apply for this program through Education Abroad: More information at ter.ps/UMRome. Education Abroad processes registrations for this course on behalf of students.

SLLX205 Italian Food and Culture (3 Credits)
This interdisciplinary course focuses on the social and cultural aspects of food and eating in different geographical areas with a special emphasis on Italy and its history. The course will be taught through a variety of readings, class discussions and presentations and there will also be some practical experiences.
Additional Information: This course is offered as part of the Maryland-in-Rome study abroad program. Students must apply for this program through Education Abroad: More information at ter.ps/UMRome. Education Abroad processes registrations for this course on behalf of students.

SLLX300 Italy Outside Italy: Italian Culture & Identity in Italy, America & the World (3 Credits)
This course is an introduction to the history of Italian emigration and Italian communities around the world as well as to the trans-national culture and identity they developed. The focus will be on Italians in America, and on the Italian emigrants' point of view. We will discuss how they viewed themselves as emigrants (not immigrants), how they thought of their communities as "colonies" (not "Little Italies"), and how they faced prejudice and discrimination to finally integrate into the new country as Italian Americans.
Credit Only Granted for: ITAL369G, ITAX303, or SLLX300.
Formerly: ITAL369G.
Additional Information: This course is offered as part of the Maryland-in-Florence study abroad program. Students must apply for this program through Education Abroad: More information at ter.ps/UMFlorence. Education Abroad processes registrations for this course on behalf of students.

SLLX301 Identity and Culture in Italy: A Comparative Approach (3 Credits)
Introduces the concept of culture in the sociological and anthropological sense. After clarifying the meaning of the word 'culture', other related concepts will be analyzed: values, norms, lifestyles, attitudes, beliefs, stereotypes. Attention will also be drawn to the notion of social and cultural change (de-secularization, globalization, mediatization, individualization). Italian-ness will be compared with traits of the American, Northern European and Mediterranean cultural heritage.
Credit Only Granted for: ITAL369D, ITAX305, or SLLX301.
Formerly: ITAL369D.
Additional Information: This course is offered as part of the Maryland-in-Florence study abroad program. Students must apply for this program through Education Abroad: More information at ter.ps/UMFlorence. Education Abroad processes registrations for this course on behalf of students.

SLLX303 The Grand Tour Then and Now (3 Credits)
Interdisciplinary course that delves into the historical importance and contemporary relevance of the Grand Tour–a transformative expedition undertaken by young adults from the 17th to the 19th centuries. Through a comprehensive and critical exploration of this pivotal period in travel history, coupled with a multi-perspective examination of modern study abroad experiences, students will gain profound insights into the realms of Critical Reception Studies, Early Modern and Modern European History, but also the evolution of travel and the complexities of Coming of Age as a literary and artistic trope and a deeply personal experience. Students will be enabled to look at their experience of studying abroad against the backdrop of a rich and complex cultural history of what it meant to step into the realm of adulthood.
Additional Information: This course is offered as part of the Maryland-in-Florence study abroad program. Students must apply for this program through Education Abroad: More information at ter.ps/UMFlorence. Education Abroad processes registrations for this course on behalf of students.

SMLP - Southern Management Leadership Program

SMLP470 Fundamentals of Entrepreneurial Ventures (3 Credits)
Learn the processes and skills needed to launch and manage start-up ventures, including technology startups. Assess the feasibility of a startup ventures, as well as how to apply best practices for planning, launching, and managing new companies by using real-world examples and in-depth case studies. Discuss a wide range of issues of importance and concern to entrepreneurs and learn to recognize opportunity, assess the skills and talents of successful entrepreneurs, and learn models and approaches that help navigate uncertainty.
Restriction: Restricted to students in the Southern Management Leadership Program.
Credit Only Granted for: HLMN470, SMLP470, ENES460 or BMGT461.
Formerly: HLMN470.
Additional Information: SMLP470 may not count toward any BMGT major or minor degree.

SMLP471 Entrepreneurial Finance (3 Credits)
Examine the elements of entrepreneurial finance, develop and analyze financial statements, focusing on technology-based startup ventures and the early stages of company development. Address key questions that challenge all entrepreneurs: how much money can and should be raised; when it should be raised and from whom; how to define a reasonable valuation of a company; and how to structure funding, develop employment contracts, and make exit decisions. Analyze the variety of financing models across a venture's life cycle, with an aim to understanding the incentives of each type of investor and the relative costs and benefits of each source of funding.
Restriction: Restricted to students in the Southern Management Leadership Program.
Credit Only Granted for: HLMN471, SMLP471, ENES466 or BMGT365.
Formerly: HLMN471.
Additional Information: SMLP471 may not count toward any BMGT major or minor degree.

SMLP472 Strategies for Innovation & Entrepreneurship (3 Credits)
Understand the process of technological change; the ways that firms come up with innovations; the strategies that firms use to benefit from innovation; and how to create new value not only through new products or services, but with novel technologies, business concepts, organizing structures, transaction/financing mechanisms, distribution channels, and market segmentation. Challenge students to think about how to create value and build a productive business organization with available resources (e.g. intelligence, insight, energy, initiative and personal relationships).
Restriction: Restricted to students in the Southern Management Leadership Program.
Credit Only Granted for: HLMN472, SMLP472, BMGT467, or ENES463.
Formerly: HLMN472.
Additional Information: SMLP472 may not count toward any BMGT major or minor degree.

SMLP473 Consulting in Tech Entrepreneurship (3 Credits)
Apply the entrepreneurship/business principles learned in the classroom to real-world consulting projects. Gain practical experience by solving actual business situations and by dealing with ambiguity and uncertainty inherent in fast-moving technical organizations. Develop key skills in negotiation, group dynamics, organization, and planning.
Restriction: Restricted to students in the Southern Management Leadership Program.
Credit Only Granted for: HLMN473 or SMLP473.
Formerly: HLMN473.
Additional Information: HLMN473 may not count toward any BMGT major or minor degree.

SMLP474 Essentials of Negotiations and Marketing for Entrepreneurs (3 Credits)
Building on the innovation and entrepreneurship knowledge acquired in previous SMLP courses, this team-taught course will equip students with the experience to conduct successful negotiations and bring an innovation to market. In the first half of this course, you will learn more about your individual negotiation style and practice the skills and techniques essential to a successful negotiation. You will then apply some of those skills, along with the human-centered mindset cultivated in previous SMLP courses, to introduce an existing product to the marketplace by identifying the promotion, distribution, and pricing tactics that meet the preferences of the intended target market. The course will conclude with a live presentation of your comprehensive go-to-market strategy to a panel of real investors, followed by a mock negotiation for an investment in bringing that product to market.
Restriction: Must be in the Southern Management Leadership Program.

SOCY - Sociology

SOCY100 Introduction to Sociology (3 Credits)
Introduces fundamental concepts and theories of sociology. Guided by C. Wright Mills' "sociological imagination," the course promotes critical thinking; challenges conventional assumptions about culture politics, history, and psychology; and equips students with theoretical approaches and research methods to analyze various sociological topics, including family, work, education, religion, social movements, and issues related to class, gender, race, and ethnic inequalities.

SOCY105 Understanding Contemporary Social Problems - Frameworks for Critical Thinking and Strategies for Solutions (3 Credits)
Embark on an exploration of contemporary social issues and unravel the intricate ways in which these challenges are woven into the fabric of society. Develop a comprehensive understanding of societal organization and partake in a detailed study of selected social problems, with a specific emphasis on issues like social conflict and inequality. This course provides an insightful journey into the nuanced interplay between societal structure and prevalent challenges, fostering a heightened awareness of the dynamics shaping our social landscape.

SOCY120 Veterans in American Society: What Does America Owe Its Veterans? (3 Credits)
An examination of current and past policies toward compensation for military veterans, data and evidence on current and past adjustments to life after military service, historical variations in the mechanisms for staffing the military, and trends in the contours of the lives of those who do not serve.

SOCY158 Special Topics in Study Abroad I (1-6 Credits)
Special topics course taken as part of an approved study abroad program.
Repeatable to: 15 credits if content differs.

SOCY200 Innovation, Exploration and the Evolution of Human Societies (3 Credits)
We will explore the nature of human societies through comparative, historical, and interdisciplinary perspectives. Students will delve into the core of social structures, unravel the defining components of society, and examine their organization, evolution, and impact on collective existence. Students will also explore the socio-historical forces and geopolitical dynamics that drive social change to analyze the complex connections that illuminate our shared social experience across time.

SOCY201 Introductory Statistics for Sociology (4 Credits)
Students will explore descriptive and inferential statistics. You will hone your quantitative analytical skills to construct impactful bivariate tables, craft frequency distributions, and decipher measures of central tendency and dispersion. Additionally, you will master the techniques of hypothesis testing, chi-square, ANOVA, and ordinary least squares regression, equipping you to seamlessly translate data into meaningful research insights.
Prerequisite: SOCY100; and (MATH107 or MATH111).
Restriction: Must not have completed STAT400, BMGT231, or ENEE324.

SOCY202 Introduction to Research Methods in Sociology (4 Credits)
We will examine why social research is needed, explore some of the main quantitative and qualitative techniques to conduct sociological research, and discover how to understand and critically evaluate sociological research on pressing social problems. Students will also learn to use specialized software to analyze and interpret quantitative data in the computer lab.
Prerequisite: SOCY100.

SOCY203 Sociological Theory (3 Credits)
Examines major trends in the history and development of sociological thought, including theories of inequality, the self, institutions, and more. With each theorist students will learn what sociologists assume and focus on when studying societies.
Prerequisite: SOCY100.

SOCY211 The Sociology Major: Mapping the Road to Academic Success (1 Credit)
Designed to assist students in making a successful transition to the major and orient them to departmental, college, and university resources. Students will collaboratively explore avenues and best practices that build self-confidence and lead to academic achievement.
Restriction: Must be in the Sociology major or Sociology minor.

SOCY212 Hate Crimes in the U.S.: What Lt. Richard Collins III Can Teach Us About History, Hope and Healing (3 Credits)
Rooted in the tragic murder of Lt. Richard W. Collins III, a Bowie State student, on the campus of the University of Maryland by a white supremacist student, this course will provide an overview and discussion of the history of bias-motivated violence in the United States, the development of modern hate crime laws, theories and impacts of victimization, domestic terrorism, legal and social responses, and prevention strategies. Students from both Bowie State University and the University of Maryland will engage with experts from multiple disciplines and work together in a collaborative community to generate actionable strategies.

SOCY216 Social Aspects of Artificial Intelligence (3 Credits)
In two generations computers insinuated themselves into the way societies create wealth, wage war, work, and govern their citizens. While scientists across disciplines debate the feasibility of engineering artificial general intelligence, the race is on to create computers (classic and quantum) that match or surpass human intelligence in as many domains as possible. Students in this course will weigh some social consequences of living with smart machines that are everywhere and never sleep, and confront the question of whether AI has gone too far, or not far enough.
Credit Only Granted for: SOCY216 or SOCY416.
Formerly: SOCY416.

SOCY222 Immigration and Ethnicity in America (3 Credits)
The history of immigration and the development of diverse populations in the United States are examined. Topics include related political controversies, the social experiences of immigrants, ethnicity, generations, migration, inter-group relations, race and diversity in American culture.
Cross-listed with: AAST222.
Credit Only Granted for: AAST222, HIST222, or SOCY222.

SOCY223 Down the Rabbit Hole: Conspiracy Theories, Paranormal Beliefs, and How to Know What's Real (3 Credits)
It is becoming increasingly difficult to know what's real. We live in a world replete with deception, biases, fake images that seem indecipherable from real ones, and widespread and coordinated efforts to misinform us. Not unrelated to this, belief in conspiracy theories and the paranormal are flourishing. This course will explore the reasons why we so often believe claims that scientists reject and accept contentions that powerful and sinister conspirators are secretly controlling major events. We will investigate who believes, why we believe, and how normal human thinking processes contribute to the holding of questionable beliefs. The course will equip students with tools to evaluate claims and to understand why people believe what they do.

SOCY224 Why are We Still Talking About Race? (3 Credits)
Explore and discuss the major debates and assumptions that construct perceptions of race and how they matter. Sociological and social science theories will give students a historical and present day frame with which to view race and ethnic relations in the twenty-first century.

SOCY225 Women's Jobs, Men's Jobs: How and Why Do They Differ? (3 Credits)
An exploration of critical issues pertaining to gender differences in the workplace. Overview of theories explaining why some people do better than others in the world of work, and discussions of more specific questions relating to women's and men's job opportunities and experiences.

SOCY227 Introduction to the Study of Deviance (3 Credits)
An introduction to the sociological study of deviant behavior, covering such topics as mental illness, sexual deviance, and the use of drugs.

SOCY230 Sociological Social Psychology (3 Credits)
Why do people do that? Sitting at the nexus of sociology and psychology, this course surveys the various ways in which sociologists have answered this question. We investigate individuals-for example, how they develop and understand themselves in relation to others, how they choose to present themselves to the world, and how they form thoughts and opinions. And we study larger units of analyses, from small groups to the broader society. Topics covered include socialization, identity formation, social influence, group processes, how social processes shape individual behavior, and how human behavior shapes society.

SOCY237 Surveillant Society, Surveillant Selves (3 Credits)
Do the social and individual benefits of surveillance outweigh its risks? Surveillance is a ubiquitous practice in contemporary society. Governments surveil populations; corporations surveil customers and users; and individuals surveil themselves and others. From red light cameras and doorbell security cameras to geo-tracking apps and smart appliances, surveillant practices shape 21st-century lifestyles. Many take these practices for granted as acceptable trade-offs for individual and collective benefits. Others sound the alarm on the dangers of being tracked and monitored, with concerns over individual liberty, social inequalities, and more. In this course we will debate how surveillance shapes social practices and selves. Students will draw their own conclusions about the role of surveillance in society, and what, if anything, should be done to change it.
Credit Only Granted for: HNUH238C or SOCY237.
Formerly: HNUH238C.

SOCY241 Inequality in American Society (3 Credits)
A broad-based overview of inequality in contemporary U.S. society, focusing on measuring patterns and trends over time. A series of learning modules familiarizes students with how inequality unfolds in relation to social stratification processes along the lines of race, gender, education and social class, income and wealth, and health.
Credit Only Granted for: SOCY241 or SOCY441.

SOCY242 Sociology of Homelessness (3 Credits)
Examines the causes of and solutions for homelessness in society. How social scientists analyze social issues using ethnographic observation, surveys, official statistics, and other research methods. Discusses how policies have responded to the problem of homelessness, and how to evaluate their effectiveness.

SOCY243 The Family: Diversity, Inequality, and Social Change (3 Credits)
An exploration of diversity and inequality in family life, focusing on empirical patterns and trends, political and cultural debates, and policy issues, including the major theories and research methods used in the sociological study of the family in a plural society.
Credit Only Granted for: SOCY243 or SOCY443.
Formerly: SOCY443.

SOCY244 Bridging Perspectives: Critical Conversations Between Students and Police (3 Credits)
This course is a university curriculum created by the International Association of Chiefs of Police to enhance community-police engagement. This course brings university students and police together to engage in facilitated dialogue to learn from one another and build trust. Through this transformative educational course, both groups will enhance their knowledge of the structural and cultural frameworks that influence historical and current events and relationships between communities and police.

SOCY245 The Family in Contemporary American Society (3 Credits)
This is a course in the sociology of the family as an institutional arena in the United States. Students will become familiar with the empirical patterns and trends, political and cultural debates, and policy issues concerning families - and the major theories and research methods used in the sociological study of the family. The readings include a textbook and a research monograph. To succeed, students will attend lectures and participate in discussion; complete quizzes and in-class writing assignments; and take a midterm and final exam.
Credit Only Granted for: SOCY243 or SOCY245.

SOCY258 Special Topics in Study Abroad II (1-6 Credits)
Special topics course taken as part of an approved study abroad program
Repeatable to: 15 credits if content differs.

SOCY265 War and Society, from the American Revolution to the Present (3 Credits)
This course asks, why do nations make war the way they do? And how does the experience of waging war in this manner remake institutions, social and political relationships and even culture? To answer these questions, the course adopts a comparative and historical perspective, highlighting the ways nations organize and mobilize for armed conflict as well as how they define 'the enemy' against whom they direct armed force, and the ways these together shape the social consequences of warfare. Among the range of social consequences, we will focus on three: the experience of combat itself; the impact of war on class, race and gender relations; and the emergence of cultural values around armed conflict and the place of warfare and soldiers in society. The course concludes with almost a month devoted to making sense of the War in Ukraine and considering where to go from here.
Credit Only Granted for: SOCY465 or SOCY265.
Formerly: SOCY465.

SOCY277 Intersectionality and Illness: How do Overarching Social Inequalities Affect Health Outcomes? (3 Credits)
Students will examine the social determinants of disease: the relationship between socioeconomic status and health care access, as well as investigate the links between social status and disease chronicity. Students will further explore how health disparities, health resource distribution, and susceptibility disproportionately affect disadvantaged communities with chronic diseases.
Credit Only Granted for: SOCY277 or SOCY302.
Formerly: SOCY302.

SOCY298 Selected Topics in Sociology (1-3 Credits)
Special topics in Sociology.

SOCY310 Sociology of Race, Class, Gender and Sports (3 Credits)
Examines the institution of sport with an emphasis on race, gender, and class. The course will critically analyze assumptions, historical relationships, and contemporary issues in sports. The course will utilize sports as a platform to understand and explore sociological concepts, theories, and research.

SOCY320 Poverty and African American Children (3 Credits)
The United States has high levels of child poverty compared to other industrialized nations. Poverty rates are particularly high among African American children. This course focuses on how poverty and race intersect to influence the development of children and youth. Specific topics that we will consider include definitions of poverty, theories about the causes of poverty, racial disparities in child poverty, family functioning in the context of poverty, neighborhood influences, risk and protective processes, and social policies and programs designed to mitigate the impact of poverty.
Cross-listed with: AAAS320.
Credit Only Granted for: AASP320, AAAS320, AASP298P or SOCY320.
Formerly: AASP298P.

SOCY322 Immigration and Ethnicity in the US (3 Credits)
Explores historical and contemporary Asian immigration to the US in comparison to and in the context of other immigrant groups. From low-skilled laborers to highly-skilled professionals, Asian and other immigrants have been an integral part of the shifting US economy and society since its inception. The course includes theories on why immigration occurs, determinants of its continuation, the uses of migrant labor, and immigrant adaptation and settlement. The second part of the course focuses on theories of ethnicity and racial formation and how immigrants develop and challenge the definitions of race, ethnicity, the "other", and ultimately, who is American. Students will also have the opportunity to gain first-hand knowledge of the immigrant experience through a life history interview project.
Cross-listed with: AAST322.
Credit Only Granted for: AAST322, SOCY222, HIST322 or SOCY322.
Formerly: AAST222, SOCY222.

SOCY325 The Sociology of Gender (3 Credits)
Institutional bases of gender roles and gender inequality, cultural perspectives on gender, gender socialization, feminism, and gender-role change. Emphasis on contemporary American society.
Prerequisite: 3 credits in SOCY courses.
Cross-listed with: WGSS325.
Credit Only Granted for: SOCY325, WMST325 or WGSS325.
Formerly: WMST325.

SOCY335 Sociology of Health and Illness (3 Credits)
An exploration of the social model to studying health and illness: how meanings and experiences of health and illness are socially produced. How experiences are shaped by the interaction of external social environments (culture, community) and the internal environment (human body), and by socio-demographic variables (race, class, gender, etc.). Disparities in health and healthcare delivery, medicalization of society, determinants of health, social construction of illness, and the social organization of health care.

SOCY336 Gender and Health (3 Credits)
The relationship between gender and health is the central focus of this course. We consider how health disparities between women and men vary by race and ethnicity, sexual and gender minority identity, and social class. We consider how institutional and cultural factors across social and spatial contexts influence gendered associations with physical and mental health. In addition, this is a course on how to do the disciplinary work of sociology. Social discourse and policies about health have been crucial to creating our current understanding of gender and health. This course will provide training in analyzing health disparities and preparing research and policy briefs about how to address these disparities. This will happen through group projects and a peer reviewed process that relies on critical feedback from sociologists engaged in the same project, in this case, the other students in this course.
Credit Only Granted for: SOCY236 or SOCY336.
Formerly: SOCY236.

SOCY340 Globalization's Winners and Losers (3 Credits)
What is the relationship between globalization and inequality? This course examines the factors shaping both between-nation and within-nation household income inequality for the past century. It is divided into four parts, each considering a different factor. First we seek to understand global trade historically. Second, we examine the more recent phenomenon of outsourcing. Third, we examine welfare and taxation policy and its role in shaping domestic inequality. Finally, we analyze the mechanisms for the accumulation of capital within global finance. By the end of the course, students will be able to discuss globalization beyond the "is it good or bad" binary and understand the complex interaction between domestic politics and international trade.

SOCY343 Rise of China (3 Credits)
Today, few questions pose more significance to scholars and policymakers than the "rise of China." As scholars grapple with explaining China's rise, they also provide tantalizing previews of the future of Chinese growth, and by extension, the future of the global economy. This course explores the character, conditions, and consequences of the rapid Chinese economic growth that many have termed "capitalism with Chinese characteristics." It summarizes three paradigms for explaining this growth: a state-centered, a market-centered, and a society-centered explanation. The course is divided in three parts, each examining a separate paradigm of development, and providing case studies of how this paradigm explains growth in specific industries and sectors of the Chinese economy.
Credit Only Granted for: SOCY343 or SOCY443.

SOCY358 Special Topics in Study Abroad III (1-6 Credits)
Special topics course taken as part of an approved study abroad program.
Repeatable to: 15 credits if content differs.

SOCY370 Career Exploration and Professional Development for Sociology Majors (1 Credit)
Prepares Sociology majors to make the transition from undergraduate to entering graduate school and/or the professional work world. Topics include career options in Sociology, skills for conducting a job search, resume writing and interview preparation, and the graduate application process.
Restriction: Must be in the Sociology major.

SOCY378 Undergraduate Teaching Assistantship (1-3 Credits)
The Undergraduate Teaching Assistant position offers exceptional Sociology undergraduates the opportunity to actively contribute to the educational process. This hands-on role involves assisting faculty in classroom activities, mentoring fellow students, and supporting academic assignments and assessments. Throughout the course, students develop crucial teaching and communication skills, learn effective time management, and gain valuable teamwork experience. This position not only enhances students' resumes but also equips them with skills vital for future academic and professional roles. This is an individual instruction course; contact the department or instructor to obtain section number.
Restriction: Permission of the Sociology Department.
Repeatable to: 9 credits if content differs.

SOCY380 Honors Independent Reading in Sociology (3 Credits)
This course permits sociology honor students to undertake a program or reading on a particular problem in sociology or a subfield therein. The reading will be done under the supervision of a member of the sociology faculty. Required of sociology honor students.
Restriction: Permission of BSOS-Sociology department.

SOCY381 Honors Independent Research in Sociology (3 Credits)
This course permits sociology students to define a particular problem in sociology or a subfield therein and to develop a research plan for use as a thesis topic. The work will be done under the supervision of a member of the sociology faculty.
Prerequisite: SOCY380.

SOCY383 Honors Thesis Research (3 Credits)
Student research under the direction of a member of the sociology faculty, culminating in the presentation and defense of a thesis reporting the research.
Prerequisite: SOCY381.

SOCY386 Experiential Learning (3-6 Credits)
Restriction: Permission of BSOS-Sociology department; and junior standing or higher.

SOCY391 Surveillance and the Erosion of Privacy (3 Credits)
Our world is under increasing amounts of surveillance, from states, corporations, and other individuals. These activities may affect our sense of privacy since surveilling others is done as a means to gather knowledge. This class examines surveillance and privacy together in order to answer the following questions: Are acts of surveillance in contemporary society eroding our sense of privacy? Are certain populations more or less privileged in terms of having privacy rights? How can we protect privacy rights in an age of surveillance?

SOCY398 Special Topics in Sociology (1-3 Credits)
Topics of special interest to both sociology majors and non-majors.
Prerequisite: 3 credits in SOCY courses.
Repeatable to: 6 credits if content differs.

SOCY398G Global Migration and the Israeli Case Study (3 Credits)
Over 70% of Israel's population is made of first, second or third generation immigrants, who came from over 70 countries, making Israel an ultimate immigrant society. This course will focus on the history of Israel as a case study for the understanding of the historical phenomena of modern immigration.
Cross-listed with: ISRL343.
Credit Only Granted for: ISRL349K, GVPT368G, SOCY398G, SOCY398I, or ISRL343.
Formerly: ISRL349K.

SOCY399 Independent Study in Sociology (1-6 Credits)
Integrated reading or research under the direction and supervision of a faculty member. A maximum of 6 credits may be earned by a student for the same field experience in SOCY386 and SOCY399 combined.
Prerequisite: 12 credits in SOCY courses.
Restriction: Permission of BSOS-Sociology department.
Repeatable to: 6 credits if content differs.

SOCY401 Intermediate Statistics for Sociologists (3 Credits)
This is a course about multiple regression for undergraduate students and presumes that students taking this course will be both producers and consumers of multiple regression results. Students will work with the instructor to produce a research poster presentation based on secondary social science data. In addition to multivariable statistics, students will learn some statistical programming as well as how to organize a research presentation.
Prerequisite: SOCY201 and SOCY202; or permission of the Sociology department.
Restriction: Must not have completed STAT400, BMGT231, or ENEE324.

SOCY407 Explaining Social Change: Fact and Fiction in Understanding Why Our World Looks the Way it Does (3 Credits)
Examines large-scale processes of social change that have produced durable and defining aspects of our contemporary world and asks, How did we get here? It focuses on four key issues: how markets and the pursuit of profit came to organize virtually all aspects of material life and restructured societies around social classes; how democratic forms of governance emerged to direct states and the persistent challenges presented by authoritarian rule; how social revolution erupts and what kinds of changes it yields; and how warfare between states can produce varieties of change not necessarily comprehended in the foregoing domains.
Prerequisite: 6 credits in SOCY courses or permission of Sociology Department.
Credit Only Granted for: SOCY498Y or SOCY407.
Formerly: SOCY498Y.

SOCY410 Social Demography (3 Credits)
Demography is the scientific study of human populations including their size, distribution, composition, and the processes that change these characteristics. Social demography examines how population processes interrelate with institutions in society, such as the family and the economy.
Prerequisite: 6 credits in SOCY courses; or permission of BSOS-Sociology department.

SOCY411 Demographic Techniques (3 Credits)
This is a survey course in techniques that are widely used in demographic analysis. These include techniques that describe population structure and change, that analyze fertility, mortality, and migration, and that evaluate demographic data. In addition, many of the analytic skills and techniques of the course have more general applicability in social science and population health research.
Prerequisite: SOCY201 and SOCY410; or permission of the Sociology department.

SOCY412 Family Demography (3 Credits)
Family and population dynamics. Fertility issues, such as teenage pregnancy, the timing of parenthood, and family size, as they relate to family behavior, such as marital patterns, child care use, and work and the family. Policy issues that relate to demographic changes in the family.
Prerequisite: SOCY201 and SOCY202; or permission of the Sociology department.

SOCY413 Sociology of Aging (3 Credits)
The aging of the population is one of the major demographic changes affecting social institutions during the next century. Research demography, sociology, economics, epidemiology, psychology and public health are integrated to develop a broader understanding of the causes and consequences of population aging. A central focus is the diversity of experiences by age, gender, socioeconomic status and health.
Prerequisite: SOCY201 and SOCY202; or permission of the Sociology department.

SOCY415 Environmental Sociology (3 Credits)
Overview of the field and theoretical themes within the area of environmental sociology and technology. Current issues are explored including: environmental attitudes; environmental movements; environmental justice; globalization; global climate change; and garbage and food.
Prerequisite: 6 credits in SOCY courses.

SOCY418 Research in Family & Demography (3 Credits)
This is a special topics research course for Family and Demography.
Prerequisite: SOCY201 and SOCY202; or permission of the Sociology department.
Repeatable to: 6 credits if content differs.

SOCY420 Qualitative Research Methods in Sociology (3 Credits)
Using the sociological imagination to independently explore research questions as designed by students. Readings will explore dilemmas qualitative researchers confront such as, how to conduct research ethically and how their background influences their findings and analysis. Students will learn how to collect data, analyze it, and present it to others.
Prerequisite: SOCY201 and SOCY202; or permission of the Sociology department.

SOCY424 Sociology of Race Relations (3 Credits)
Encourages sociological thinking about US racial and ethnic minority populations, with a focus on African Americans, Latinos, Asian Americans, and Native Americans. The central concern is to understand and explain racial/ethnic inequality. A wide array of topics are discussed, including prejudice and discrimination, slavery, residential segregation, cultural inequality, skin tone stratification, economic and educational disparities, and assimilation/generational processes.
Prerequisite: 6 credits in SOCY courses; or permission of the Sociology department.
Cross-listed with: AAST424.
Credit Only Granted for: SOCY424 or AAST424.

SOCY428 Research in Inequality (3 Credits)
This is the special topics research course for Stratification and Inequality.
Prerequisite: SOCY201 and SOCY202; or permission of the Sociology department.
Repeatable to: 6 credits if content differs.

SOCY431 Principles of Organizations (3 Credits)
Structural and processual characteristics of organizations that make them effective for different purposes and in different environments. Effects of different institutional environments, small group processes, organizational networks, and leadership. Types of organizations studied include formal bureaucracies, professional organizations, and voluntary associations.
Prerequisite: SOCY201 and SOCY202; or permission of BSOS-Sociology department.

SOCY432 Social Movements (3 Credits)
This course broadens students' understanding of social movements in the United States. Many topics are discussed, including the emergence of social movements, why people join social movements, collective identity, gender, culture, emotions, tactics, repression, and the decline of social movements. Various movements are reviewed, including the civil rights movement, the Chicano movement, the women's movement, the LGBTQ movement, the white power movement, the American Indian movement, and the animal rights movement.
Prerequisite: 6 credits in SOCY courses; or permission of BSOS-Sociology department.

SOCY433 Social Movements and Race (3 Credits)
This course aims to broaden our understanding of racial and ethnic minority social movements in the United States. We will often reference protests by African Americans and Latinos, such as by focusing on slave resistance, the modern civil rights movement, and Chicano movements. We will discuss various topics, including movement emergence, why people join and pick their tactics, government repression, movement outcomes, and movement decline. We will interrogate ways that movement processes and theoretical tools may be racially variant and strive to uncover how approaches used by scholars who study race (e.g., intersectionality, critical race theory, racialization) can be applied, and perhaps challenge, traditional social movement scholarship.
Prerequisite: 6 credits in SOCY courses; or permission of BSOS-Sociology department.

SOCY435 Society, Biology, and Health (3 Credits)
It is not too far-fetched to speak of the pancreas under capitalism or the proletarian lung. Humans are social beings in physical bodies. In this course, we draw on research studies, podcasts, news articles, and best-selling non-fiction to inform conversation and writing on how various dimensions of human biology influence, and are influenced by, our social and cultural environment. We focus on conceptualizing human behavior as an interplay between both nature and nurture, and consider how this approach changes our understanding of modern social problems. This course is appropriate for students with a range of backgrounds in the social and natural sciences; introductory-level supplemental readings on all necessary biological concepts will be provided.
Prerequisite: Must have completed 6 credits in SOCY courses or permission of BSOS Sociology Department.

SOCY441 Social Stratification and Inequality (3 Credits)
The sociological study of social class, status, and power. Topics include theories of stratification, correlates of social position, functions and dysfunctions of social inequality, status inconsistency, and social mobility.
Prerequisite: 6 credits in SOCY courses; or permission of BSOS-Sociology department.
Restriction: Junior standing or higher.

SOCY442 The Black Middle Class (3 Credits)
Students will learn about the Black Middle Class. They will examine and explore the historical context that led to the rise of a Black Middle Class. Innovative avenues into the Black Middle Class will also be examined, including various household and family formations. Finally, the course will cover the consequences of being in the The Black Middle Class, with an emphasis on residential segregation and racial identity.
Prerequisite: 6 credits in SOCY courses.

SOCY445 Sex and Love in Modern Society (3 Credits)
Sociological theories of sex and gender are used to explore empirical research on women's and men's sexual behavior and attitudes; variation in gendered sexuality by key social characteristics and how gendered sexuality is constructed and controlled; changes in sexuality over time and across relationship types, focusing on changes in sexual desire and behaviors and on the changing meaning of sex and marriage in U.S. society and other countries. Contemporary debates about sexuality will also be examined.
Prerequisite: SOCY201, SOCY202, SOCY203, and SOCY230.
Restriction: Must be in Sociology program; or permission of BSOS-Sociology department.

SOCY450 Investigating Women's Empowerment in Low and Middle Income Countries (3 Credits)
Students in this course will learn how the study of women's empowerment in low and middle income countries (LMICs) has developed, its current state of measurement, and new avenues to pursue in the future. Examining the extensive research on gender-based inequalities in educational attainment, employment rates, and health status, students will investigate how power imbalances across individuals, households, and institutional factors result in persistent inequality. Bringing an intersectional perspective to the forefront of the course, we will study how to design effective intervention policies that seek to improve the daily lives of women, girls and their families.
Prerequisite: SOCY201 and SOCY202; or permission of BSOS-Sociology department.

SOCY451 Sociology of Culture (3 Credits)
Analyzes the relationship between society and culture. How do social forces affect cultural objects and products? How do values and meanings shape individual behavior? How can culture be both a source of domination and resistance? These and other topics will be analyzed to show the role of culture in our lives.
Prerequisite: 6 credits in SOCY courses; or permission of the department.
Credit Only Granted for: SOCY498C or SOCY451.
Formerly: SOCY498C.

SOCY452 Sociology of Mental Health (3 Credits)
The class focuses upon the larger question: "What is the balance between people being mentally 'ill' and us having a 'sick' society?" To explore this question, students will utilize sociological approaches toward mental illness and health. This will manifest as a focus on how social organization is related to mental health and illness. Students will consider how sociologists understand the nature, distribution, and treatment of mental illness and health in society, and will develop a personal understanding of what it means to be mentally healthy.
Prerequisite: 6 credits in SOCY courses; or permission of the department.
Credit Only Granted for: SOCY498O or SOCY 452.
Formerly: SOCY498O.

SOCY453 Racial Residential Segregation (3 Credits)
Examines how race and ethnicity have historically shaped residential patterns in the U.S. and their continuing importance today. Students will investigate the causes of residential segregation, including residential preferences, discrimination, and socioeconomic differences between racial and ethnic groups. Significant attention will be paid to how immigration and ensuing ethnic and racial diversity are reshaping the residential landscape. The readings highlight the U.S. context, though residential patterns in different countries are also briefly discussed.
Prerequisite: 6 credits in SOCY courses; or permission of the department.
Credit Only Granted for: SOCY498D or SOCY453.
Formerly: SOCY498D.

SOCY455 Social Dimensions of Privacy and Surveillance (3 Credits)
Today, it is quite common in many spheres of life that we divulge personal information in exchange for something else. This course examines practices of surveillance in contemporary society in relationship to collective understandings of privacy. By the end of this course, students will be able to analyze privacy norms and practices in the age of mass surveillance, how surveillance produces inequalities in relation to privacy, and how definitions and regulations of privacy and surveillance change over time.
Prerequisite: 6 credits in SOCY courses; or permission of the department.
Credit Only Granted for: SOCY391 or SOCY455.

SOCY456 Smart Machines and Human Prospects (3 Credits)
Artificial intelligence is everywhere and never sleeps. It is transforming our social institutions in intended and unintended ways. While scientists debate the feasibility of engineering conscious machines with general intelligence, no one debates that the global race is on to create more potent computers. Through targeted research, discussion, and presentation of findings students will answer a specific question on how, where, and in what ways society is being changed by smart machines.
Prerequisite: SOCY201 and SOCY202; or permission of the Sociology department.
Credit Only Granted for: SOCY416 or SOCY456.

SOCY457 Sociology of Law (3 Credits)
Students will be introduced to sociological theories and frameworks used to examine how the law shapes society and how society shapes the law. Students will explore various approaches to jurisprudence influenced by sociology and investigate: how different social theorists have interpreted the role of law in society, whose interests the law serves, and the law's role in societal transformation. The course will enable students to understand how the law influences and is influenced by power, social change, legitimacy, compliance, deterrence, social reproduction, and inequality (including race, class, gender, and sexuality).
Prerequisite: 6 credits in SOCY courses; or permission of BSOS-Sociology department.

SOCY458 Special Topics in Study Abroad IV (1-6 Credits)
Special topics course taken as part of an approved study abroad program.
Repeatable to: 15 credits if content differs.

SOCY461 Sociology in Action: Research and Community Engagement in Prince George's County (3 Credits)
Sociology in Action is a research course that will use the science of sociology to inform real life issues and contribute to the development of social programs. In this course, students will gain hands-on experience in applying sociology by working with clients in Prince George's County on specific social problems and issues. Please assess your ability to commit to this course and fulfill all requirements. Given that students will be working with Prince George's County organizations, there will be some variation and unpredictability in the nature of the projects.
Prerequisite: SOCY202; or students who have taken courses with similar content may contact the department.

SOCY462 Digital Technology and Society (3 Credits)
Situates digital technology in our social environment and then examines how this relationship reflects, reinforces, or reorders social hierarchies. Students will learn the conceptual and methodological foundations for studying and evaluating how technologies such as health and social media apps, the personal computer, artificial intelligence, and weapons of war have evolved, diffused and impacted social life. Students will explore and then conduct independent research on the relationship between technology and social inequalities through the lens of health and medicine, the environment and climate change, jobs and the workplace, as well as government and criminal justice.
Prerequisite: Must have completed 6 credits in SOCY courses; or permission of BSOS-Sociology department.

SOCY463 Sociology of Masculinity: How Much Has Masculinity Really Changed? (3 Credits)
An examination of the history both feminist social movements and feminist sociology in a specific way. It uses the sociological subfield of men and masculinities as a keyhole through which we will study 'the stalled revolution' for women's equality. Along the way, we will familiarize ourselves with academic and popular reports about changing and contested definitions, ideas, and behaviors of masculinity.
Prerequisite: 6 credits in SOCY courses; or permission of BSOS Sociology department.

SOCY465 The Sociology of War: State and Society since the American Revolution (3 Credits)
Since the American and French Revolutions at the end of the eighteenth century, warfare has been marked by the way national states draw ordinary people into armed conflicts--as members of the military, producers and controllers of resources and supporters or resisters, and also as targets and victims. This course examines how the centering of ordinary people in war has transformed over time, continuing right up to the current conflict in Ukraine. Alongside explaining why states make war the way they do, the course explores the impacts of making war and living through conflict on the societies embroiled in it.
Prerequisite: Must have completed 6 credits in SOCY courses; or permission of BSOS-Sociology department.
Credit Only Granted for: SOCY465 or SOCY265.

SOCY467 Sociology of Education (3 Credits)
Students will examine educational institutions from a sociological perspective by analyzing the latent and manifest functions of schooling. Students will study schools as structured organizations; investigate the various roles and subcultures present among teachers and students; and explore educational disparities in access and achievement.
Prerequisite: 6 credits in SOCY courses; or permission of BSOS-Sociology department.

SOCY470 Pregnancy and Parenthood in an Unequal Society (3 Credits)
Analysis of patterns in sexual activity, contraceptive use, and unintended pregnancy, and how they reinforce or alleviate socioeconomic, gender, and racial inequalities. Emphasis on the role of healthcare providers and contraceptive access, attitudes about motherhood and contraception, policy interventions, and institutional designs. Social and economic consequences of increasing women's ability to control their fertility.
Prerequisite: 6 credits in SOCY courses; or permission of Sociology Department.

SOCY475 Sociology of Emotions (3 Credits)
Emotions are often thought of as purely subjective experiences. How much more personal than one get than their emotions and feelings? In addition to their physiological and psychological aspects, however, emotions have a social side that often go unnoticed. This course will introduce you to the social aspects of emotions. In doing so, we will cover wide-ranging topics including the social causes of emotions, social norms about emotions, disparities in emotionalexperiences, and the ways in which emotions can maintain and reshape society.
Prerequisite: 6 credits in SOCY courses; or permission of BSOS-Sociology Department.
Credit Only Granted for: SOCY498W or SOCY475.
Formerly: SOCY498W.

SOCY480 Researching the Middle East (3 Credits)
Introduces religion, gender, and politics in the Middle East and North Africa. After an overview of the political and social history the focus will be on methods for carrying out research on fundamental issues facing Middle Eastern societies, including national identity, religion, gender relations and the status of women in the family, politics, education, and labor market.
Prerequisite: SOCY201 and SOCY202; or permission of the Sociology department.

SOCY481 Ideology and Social Conditions in the Making of Terrorism in the Middle East and North Africa (3 Credits)
The sociology of terrorism and political violence in the Middle East and North African will be explored in this course.
Prerequisite: Must have completed 6 credits in SOCY courses or permission of the Sociology department.
Restriction: Sophomore standing or higher.

SOCY490 Experimental Research Practicum (3 Credits)
Hands-on experience in designing, conducting, and analyzing experimental research. Introduces students to causal inference in social scientific research, focusing on experimental designs. Students will get hands-on research experience running experimental studies in the group processes lab. Students will also work with the professor and graduate students in the department to develop a research idea that can be executed in the spring semester.
Prerequisite: SOCY201 and SOCY202; or permission of the Sociology department.
Additional Information: This is the first course in the experimental research practicum 2-course sequence.

SOCY491 Experimental Research Design (3 Credits)
Students will finalize the design of their studies from the fall semester and carry out the research in this course. Introduces students to analyzing experimental data and presenting results from these data. Students will continue to get hands-on research experience running experimental studies in the group processes lab and working with the professor and graduate students in the department to further develop their projects.
Prerequisite: SOCY201, SOCY202 and SOCY490; or permission of BSOS-Sociology department.
Additional Information: This is the second course in the experimental research practicum 2-course sequence.

SOCY498 Selected Topics in Sociology (1-3 Credits)
Topics of special interest to advanced undergraduates in sociology. Such courses will be offered in response to student request and faculty interest.
Prerequisite: SOCY201 and SOCY202; or permission of BSOS-Sociology department.
Repeatable to: 6 credits.

SPAN - Spanish

SPAN103 Elementary Spanish for Intercultural Communication I (4 Credits)
Develops students' communicative competence at the novice mid/high level of proficiency. Introduces students to global Hispanophone cultures.
Prerequisite: Must have appropriate World Language Placement (WLP) score.
Restriction: Must not be a native/fluent speaker of Spanish. Native/fluent speakers of Spanish or students who have previously attended school in Spanish speaking countries should take the WLP and see the Spanish Undergraduate Advisor to identify the correct Spanish course for which to register.
Credit Only Granted for: SPAN102 or SPAN103.

SPAN169 Special Topics in Study Abroad I (1-6 Credits)
Special topics course taken as part of an approved study abroad program.
Repeatable to: 15 credits if content differs.

SPAN203 Elementary Spanish for Intercultural Communication II (4 Credits)
Continues to develop students' communicative competence at the novice high/intermediate low level of proficiency. Furthers the introduction to global Hispanophone cultures.
Prerequisite: SPAN103; or must have appropriate World Language Placement (WLP) score.
Restriction: Must not be a native/fluent speaker of Spanish. Native/fluent speakers of Spanish or students who have previously attended school in Spanish speaking countries should take the WLP and see the Spanish Undergraduate Advisor to identify the correct Spanish course for which to register.

SPAN204 Intermediate Spanish for Intercultural Communication (3 Credits)
Further develops students' communicative competence at the intermediate mid/high level of proficiency. Fosters expanded knowledge of and appreciation for global Hispanophone cultures.
Prerequisite: SPAN203; or must have appropriate World Language Placement (WLP) score.
Restriction: Must not be a native/fluent speaker of Spanish. Native/fluent speakers of Spanish or students who have previously attended school in Spanish speaking countries should take the WLP and see the Spanish Undergraduate Advisor to identify the correct Spanish course for which to register.

SPAN206 Spanish for Heritage Speakers I (3 Credits)
Review of oral and written Spanish for students who have native or near native knowledge of, but no formal education in Spanish. Taught in Spanish.
Prerequisite: Native or near native knowledge of and no formal education in Spanish.

SPAN207 Reading and Writing in Spanish (3 Credits)
Selected readings with emphasis on reading comprehension and the development of reading strategies. Work in composition writing and a review of selected grammatical topics. Complements material of SPAN204.
Prerequisite: Must have completed or be concurrently enrolled in SPAN204; or must have appropriate World Language Placement (WLP) score.

SPAN222 Cultural Difference in Contemporary Latin America (3 Credits)
Introduction to representations and expressions in Latin America: cultural stereotypes, representations of difference, forms of discrimination, sublimation of difference into national identity, and the staging of the other. Taught in English.

SPAN224 Violence and Resistance in the Americas (3 Credits)
Indigenous vision of violence and resistance in the Americas. Texts and maps from the European explorers and conquerors are also studied. Readings include primary texts from the 16th as well as from the 20th century. Taught in English.

SPAN228 Selected Topics in Latin American Literature and Society (3-6 Credits)
Variable cultural studies topics on literature and society in contemporary Latin America. Taught in English.
Cross-listed with: PORT228.
Repeatable to: 6 credits if content differs.
Credit Only Granted for: PORT228 or SPAN228.

SPAN229 Selected Topics in Latin American Culture (1-3 Credits)
Varied topics in Latin America culture.
Repeatable to: 9 credits if content differs.

SPAN234 Issues in Latin American and Caribbean Studies I (3 Credits)
Interdisciplinary study of major issues in Latin America and the Caribbean, including Latin America's cultural mosaic, migration and urbanization. Democratization and the role of religions. Taught in English.
Cross-listed with: LACS234, PORT234.
Credit Only Granted for: LASC234, PORT234, SPAN234, or LACS234.
Formerly: LASC234.

SPAN235 Issues in Latin American and Caribbean Studies II (3 Credits)
Major issues shaping Latin American and Caribbean societies including the changing constructions of race, ethnicity, gender and class as well as expressions of popular cultures and revolutionary practices. Taught in English.
Cross-listed with: LACS235, PORT235.
Credit Only Granted for: LASC235, PORT235, SPAN235, or LACS235.
Formerly: LASC235.

SPAN269 Special Topics in Study Abroad II (1-6 Credits)
Special topics course taken as part of an approved study abroad program.
Repeatable to: 15 credits if content differs.

SPAN269R Global Issues, Local Approaches: Colonialism, Public Health, and Climate Change in Puerto Rico (3 Credits)
Students will explore the intersections of culture, politics, and climate change in Puerto Rico's Caribbean archipelago and how local actors and community-led movements address these challenges. Through lectures, site visits, and hands-on service projects, students will focus on Puerto Rico as a case study to explore local approaches to critically claim more vital institutions, promote sustainable practices, and implement climate action solutions. The program will highlight the island's activism by engaging with local scholars, community leaders, and organizations tackling issues such as climate change, disaster recovery, renewable energy, and public health inequities. By critically analyzing these themes and participating in collaborative service projects, students will gain a multidisciplinary understanding of Puerto Rico's past and present while reflecting on global sustainability and social justice issues.
Cross-listed with: HLSC242.
Credit Only Granted for: HLSC242 or SPAN269R.
Additional Information: This is an Education Abroad course.

SPAN301 Advanced Grammar and Composition I (3 Credits)
Practice of complex grammatical structures through reading and writing of compositions and essays. Specific lexical, syntactic, rhetorical, and stylistic devices will be highlighted.
Prerequisite: Must have completed or be concurrently enrolled in SPAN207.

SPAN302 Advanced Grammar and Composition II (3 Credits)
Practice in and writing of different types of compositions and essays, including narrations, descriptions, and persuasive writing. Review of problematic syntactical structures.
Prerequisite: SPAN301.

SPAN303 Approaches to Cultural Materials in the Hispanic World (3 Credits)
Development of proficiency in critical thought through the reading, viewing, and analytical discussion of major genres and styles of cultural materials selected from Spanish-speaking world. Taught in Spanish.
Prerequisite: SPAN301.
Recommended: May elect to take SPAN311 and/or SPAN316 in same semester as SPAN303.

SPAN306 Spanish for Heritage Speakers II (3 Credits)
Practice of complex grammatical structures through reading and writing of compositions and essays. Specific lexical, syntactic, rhetorical and stylistic devices will be highlighted. Designed for Spanish speakers educated in English. Taught in Spanish.
Prerequisite: SPAN206.

SPAN307 Oral Communication Skills for Heritage Speakers of Spanish (3 Credits)
Development of techniques for formal public speaking in Spanish. Writing and delivering oral presentations for varied audiences and purposes. Includes strategies for organization, the use of rhetorical patterns, and the development of effective discourse. Designed for Heritage speakers of Spanish with native or near native knowledge of Spanish, but no formal education in Spanish. Taught in Spanish.
Prerequisite: Native or near native knowledge of and no formal education in Spanish.

SPAN311 Advanced Communication I (3 Credits)
Further development of listening, speaking, and writing skills in Spanish. Opportunity to develop oral and written fluency, improve pronunciation and increase vocabulary. Individual and/or group oral presentations. Taught in Spanish.
Prerequisite: SPAN301; and must have completed or be concurrently enrolled in SPAN303.
Restriction: Must not be a native/fluent speaker of Spanish.

SPAN312 Advanced Conversation II (3 Credits)
Continued mastery of listening and speaking skills in Spanish. Opportunity to develop oral fluency, improve pronunciation, and increase vocabulary. Emphasis on colloquial and technical language as well as development of linguistic accuracy. Individual and/or group oral presentation.
Prerequisite: SPAN311.
Restriction: Must not be a native/fluent speaker of Spanish.

SPAN316 Spanish Translation I (3 Credits)
Translation of texts into Spanish and/or English. Taught in Spanish.
Prerequisite: SPAN301; and must have completed or be concurrently enrolled in SPAN303.

SPAN317 Translation II (3 Credits)
Translation of non-literary, non-technical texts into Spanish and/or English.
Prerequisite: SPAN316.

SPAN318 Translation of Technical Texts (3 Credits)
Specialized texts in law and international affairs into Spanish and/or English. Taught in Spanish.
Prerequisite: SPAN303; and (SPAN311 or SPAN316).
Repeatable to: 6 credits if content differs.

SPAN325 Hispanic Linguistics I: Grammar and Society (3 Credits)
Sociolinguistic approach to Spanish grammar focusing on real-life exploration of the ways linguistic structures change and are used in different parts of the Spanish-speaking world. Taught in Spanish.
Prerequisite: SPAN303; and (SPAN311 or SPAN316).
Credit Only Granted for: SPAN310 or SPAN325.
Formerly: SPAN310.

SPAN331 Spanish Culture, Civilization and Literature I: Medieval Times (3 Credits)
The exploration of cultures of the Iberian Peninsula from its origins until the 15th century as well as the study of historical and political events that gave rise to the Spanish state. Taught in Spanish.
Prerequisite: SPAN303; and (SPAN311 or SPAN316).

SPAN332 Spanish Culture, Civilization and Literature II: Renaissance and Baroque (3 Credits)
An overview of cultural and literary production of Spain from the late 15th through late 17th centuries, exploring the production of literary texts in their socio-historical, political, religious and cultural contexts and development. Taught in Spanish.
Prerequisite: SPAN303; and (SPAN311 or SPAN316).

SPAN333 Spanish Culture, Civilization and Literature III: Modern Times (3 Credits)
An overview of cultural and literary production of Spain from the late 17th century through the present day, exploring the production of literary texts in their socio-historical, political, religious and cultural contexts and development. Taught in Spanish.
Prerequisite: SPAN303; and (SPAN311 or SPAN316).

SPAN335 Cultural History of Seville (4 Credits)
Cultural History of Seville: An exploration of the Iberian, Mediterranean, and transatlantic contexts shaping the history, identity, and cultural and artistic expressions of Seville. Includes texts from the Middle Ages to the twenty first century. Focus on the historical, literary and cultural evolution of Seville from the Roman Empire and the Moorish occupation to the discovery and conquest of America until present times. Taught in Spanish.
Prerequisite: SPAN301.
Recommended: SPAN303.

SPAN359 Spanish for the Professions (3-9 Credits)
Exploration of cultural and linguistic skills for different professional contexts including vocabulary, listening, speaking, reading and strategies. No experience in the professional area necessary. Taught in Spanish.
Prerequisite: SPAN316; or permission of department.
Repeatable to: 9 credits if content differs.

SPAN361 Latin American Literatures and Cultures I: From Pre-Columbian to Colonial Times (3 Credits)
Overview of cultural history of Latin America from pre-Columbian civilizations to the Colonial period, exploring the foundations of the Spanish American cultural and literary tradition to approximately 1770. Taught in Spanish.
Prerequisite: SPAN303; and (SPAN311 or SPAN316).

SPAN362 Latin American Literatures and Cultures II: From Independence to Nation Formation (3 Credits)
An overview of cultural and literary production of Latin America from the 18th Century to approximately 1900, exploring the production of literary texts in their socio-historical, political, and cultural contexts and development. Taught in Spanish.
Prerequisite: SPAN303; and (SPAN311 or SPAN316).

SPAN363 Latin American Literatures and Cultures III: From Modernism to Neo-Liberalism (3 Credits)
An overview of cultural and literary production of Latin America from the late 19th through the early 21st centuries, exploring the production of literary texts in their socio-historical, political, and cultural contexts and development. Taught in Spanish.
Prerequisite: SPAN303; and (SPAN311 or SPAN316).

SPAN369 Special Topics in Study Abroad III (1-6 Credits)
Special topics course taken as part of an approved study abroad program.
Repeatable to: 15 credits if content differs.

SPAN370 Spanish for Business I (3 Credits)
Business Spanish terminology, vocabulary and practices. Emphasis on everyday spoken and written Spanish. Readings and discussions of Spanish commercial topics. May include exposure to Spanish commercial topics. May include exposure to Spanish business environments. Taught in Spanish.
Prerequisite: SPAN303; and (SPAN311 or SPAN316).

SPAN371 Spanish for the Health Professions (3 Credits)
Exploration of cultural and linguistic skills for the health professions including vocabulary, listening, speaking, reading and strategies. No experience in the professional area necessary. Taught in Spanish.
Prerequisite: SPAN303; and (SPAN311 or SPAN316).

SPAN372 Spanish and the Law (3 Credits)
Offers students the opportunity to enhance Spanish linguistic and intercultural communication skills in contexts of legal practice through the translation of a variety of legal documents. Introduces Spanish legal terminology in areas such as immigration, consumer protection, and criminal/employment/housing/family law. Students will learn how to apply these language and cultural skills as future legal practitioners interacting with clients who possess limited English proficiency. Native or fluent guest participants will expose students to legal terminology, registers, and dialects from various Spanish-speaking countries. The goal of the class is to enable students to, at a minimum, conduct intake interviews in a culturally competent fashion with Spanish-speaking clients without the assistance of interpreters. The course is designed to be beneficial for students with varying levels of Spanish language ability, up to and including students who are native or heritage speakers of Spanish. Taught in Spanish
Prerequisite: SPAN311 or SPAN316.

SPAN373 Spanish in the Media (3 Credits)
Exploration of Spanish in current events in the Hispanic world in local and international press and varied media, and production of journalistic articles.
Prerequisite: SPAN303; and (SPAN311 or SPAN316).

SPAN374 Spanish in the Community (3 Credits)
Provides students with context for understanding, communicating with, and working with the Spanish-speaking community. Topics include Latino/a demographics, cultures, communities, work opportunities and local uses of Spanish. Requires outside service-learning work.
Prerequisite: SPAN303; and (SPAN311 or SPAN316).

SPAN375 Spanish in the Life Sciences (3 Credits)
Communication and critical thinking skills in Spanish through the study of materials related to science. The course engages students in class discussions about a variety of topics in different formats, such as book chapters, articles, film, art, and literary works. The course is divided into five units that will allow the study of specific geographies, topics, and cases in the Spanish-speaking world. Assignments include a research proposal and visits to the National Zoo and the National Museum of Natural History. No technical knowledge is necessary, as we will emphasize the language of science, not the content itself. Taught in Spanish.
Prerequisite: SPAN303 and SPAN311; or SPAN316; or permission of instructor.

SPAN386 Experiential Learning (3-6 Credits)
Prerequisite: Permission of ARHU-School of Languages, Literatures, and Cultures department.
Restriction: Junior standing or higher.

SPAN388W Writing Center Internship (1-6 Credits)
Examines face-to-face and online writing center theory and practice through readings, exercises, and supervised tutoring. Students investigate the writing process and help other writers to negotiate it.
Prerequisite: Permission of the Writing Center (1205 Tawes Hall).
Cross-listed with: ENGL388W.
Repeatable to: 12 credits.
Credit Only Granted for: ENGL388W or SPAN388W.

SPAN399 Independent Study in Spanish (1-3 Credits)
Specific readings in literature or a translation project under the supervision of a faculty member of the department.
Prerequisite: Permission of ARHU-School of Languages, Literatures, and Cultures department.
Repeatable to: 3 credits.

SPAN401 Advanced Composition I (3 Credits)
Compositions and essays with emphasis on stylistics, idiomatic and syntactic structures. Organization and writing of research papers.
Prerequisite: SPAN302; or permission of ARHU-School of Languages, Literatures, and Cultures department.

SPAN402 Advanced Composition II (3 Credits)
Compositions and essays with emphasis on stylistics, idiomatic and syntactic structures. Organization and writing of research papers.
Prerequisite: SPAN401; or permission of ARHU-School of Languages, Literatures, and Cultures department.

SPAN404 The Bright Middle Ages (3 Credits)
The period that precedes the Renaissance has been traditionally labeled as the "dark" Middle Ages and it is common to associate an evil, brutality and barbarian life style with the time span comprised of between the 5th and the 15th centuries. This undergraduate seminar does not intend to embellish the truth or to minimize the hardships of life and death at the time of the Crusades. In fact, an objective timeline of historical events that marked that period as middle will be provided, and the central question to be addressed in this class is, "Middle of what"? As we try to answer it, we will be able to examine many "modern" aspects of the Middle Ages. Some of them have been highlighted since the beginning of the 20th century and justify a view of the Middle Ages as a bright and "modern" period in which, while overcoming despicable difficulties and a lack of facilities, the most precious treasures of our times were intellectually conceived, manufactured, built, and written. Taught in Spanish.
Prerequisite: SPAN331, SPAN332, SPAN333, SPAN361, SPAN362, or SPAN363; or permission of instructor.
Credit Only Granted for: SPAN404, or SPAN408I.
Formerly: SPAN408I.

SPAN405 North American Neomedievalism: the U.S. East Coast and 16th-Century Spain (3 Credits)
The fall of the Roman Empire certainly did not affect North America, but the European Middle Ages created several patterns of expansion that, with considerable transformations, are present in North America and all over the world. Through the study of Neomedievalism, students will be able to better understand today's national and international relations. We will read scholarship that helps us understand that it is not an accident that we have replicas of medieval villas and that we are increasingly interested in developing games and producing movies that replicate medieval life. We will also study why the failure and success of social and economic systems of the past have influenced modern civilizations and why the loaded concepts of "barbarian" and "foreign" have not disappeared. Taught in Spanish.
Prerequisite: SPAN331, SPAN332, SPAN333, SPAN361, SPAN362, or SPAN363; or permission of instructor.
Credit Only Granted for: SPAN405 or SPAN408C.
Formerly: SPAN408C.

SPAN406 Don Juan Manuel's Fictional and Historical Prose (3 Credits)
Dedicated to the literary production of an important author: Don Juan Manuel. By examining the interaction among writing, reading and the oral acquisition of knowledge in his works, special attention will be given to how the border between fact and fiction is constructed in the Middle Ages.
Prerequisite: SPAN333, SPAN361, SPAN331, SPAN332, SPAN362, or SPAN363.

SPAN407 Early Modern US and Early Modern Spain: A Common History (3 Credits)
The impact of Spanish early modern literature, cartography and architecture in the US Atlantic Coast (Labrador Peninsula to Florida). The class will start with readings that will provide a general overview of the Spanish presence in the US and its role in the early history of this country. We will continue reading about the voyages of exploration to the US East Coast of 1521-1526, which were sponsored by a Spaniard, Lucas Vazquez de Ayllon. These voyages subsequently resulted in a territory named "Tierras de Ayllon" (from Florida to the Chesapeake Bay). These Lands of Ayllon were located on the settlement of Chicora and the Missions of Ajacan and San Miguel de Gualdape. We will focus on the history and the geographical location of these Spanish establishments; they paralleled geographically and anteceded chronologically those of the British colony at Roanoke (1585) and the eventual establishment of Jamestown (1607). Taught in Spanish.
Prerequisite: SPAN331, SPAN332, SPAN333, SPAN361, SPAN362, or SPAN363; or permission of instructor.

SPAN408 Special Topics in Iberian and Latin American Studies (3 Credits)
Special topics in (a) the literature and film of Spain, Spanish-speaking Latin America, and U.S. Latina/o communities; (b) Spanish linguistics; and (c) Spanish, Latin American, and U.S. Latino cultural studies. Each topic will be announced when the course is offered.
Prerequisite: SPAN333, SPAN361, SPAN331, SPAN332, SPAN362, or SPAN363.

SPAN410 Libro de Buen Amor: Literary Matchmaking, Theory, and Praxis (3 Credits)
Literary traditions in the Libro de buen amor. Taught in Spanish
Prerequisite: One of the following SPAN331, SPAN332, SPAN333, SPAN361, SPAN362, or SPAN363; or permission of instructor.
Credit Only Granted for: SPAN410 or SPAN413.
Formerly: SPAN413.

SPAN412 Women in the Middle Ages: Myths and Daily Life (3 Credits)
Explores the role of women during the Middle Ages and analyzes the active participation of women in a society in which men's occupation was warfare. Also explores "feminine voices" and female representations in the literature of the times.
Prerequisite: SPAN333, SPAN361, SPAN331, SPAN332, SPAN362, or SPAN363.

SPAN418 Hispanic Literature in Translation (3 Credits)
Repeatable to: 6 credits if content differs.

SPAN420 Spanish and Spanish-Speaking Communities in the US (3 Credits)
Lays the foundations for the historical, linguistic, cultural, sociological, and political study of Spanish in the United States (US). The main goal of the course is to develop critical awareness about the relationship between language, individuals, and society within the diverse Spanish-speaking communities of the US. To this end, the course will analyze issues concerning, first, the historical and dialectal characteristics of the Spanish language in different regions of this country; second, the acquisition of Spanish as a minority language and in contact with both English and a large number of Spanish dialects; and third, the space that Spanish occupies in US public life now and in the future. The design of activities, assignments, and assessment procedures is based on promoting individual and collective awareness about crucial topics related to the present and the future of Spanish as one of the national languages of the US.
Prerequisite: SPAN325, SPAN425, or permission of instructor.
Credit Only Granted for: SPAN478A or SPAN420.
Formerly: SPAN478A.

SPAN422 Intercultural Communication and Negotiation (3 Credits)
Focuses on the relationship of language and culture of those operating in world markets. Particular attention will be given to intercultural communication, linguistic systems, culture specific perceptions of, and negotiation with, the Spanish-speaking world. Taught in Spanish.
Prerequisite: SPAN370 OR SPAN371 OR SPAN373 OR SPAN 374.
Restriction: Junior standing or higher.

SPAN425 Hispanic Linguistics II: Structures of Spanish (3 Credits)
This course begins with an introduction to general concepts in linguistics, from language function and the brain to communication, culture, and thought, and their relation to other disciplines in the social sciences. The main purpose of this course is to provide an overview of Hispanic linguistics through multiple perspectives, while exploring the areas of Spanish morphology, syntax, and semantics. This course will also focus on the structural tendencies of Spanish through a variety of practical activities. Taught in Spanish.
Prerequisite: SPAN303; and SPAN311 or SPAN316 or SPAN325.

SPAN426 Hispanic Linguistics III: Language in Use (3 Credits)
Designed for students without previous experience in Linguistics. Focus on language variation and use, linguistic change, and bilingualism. Taught in Spanish.
Prerequisite: SPAN303; and SPAN311 or SPAN316 or SPAN325. Also offered as: SPAN626.
Credit Only Granted for: SPAN426 or SPAN626.

SPAN427 Visions and Fictions from Spain (3 Credits)
Overview of Spanish Cinema from the end of the 19th century through present day Spain. Exploration of the production of literary and cinematic texts in their sociohistorical, political, religious and cultural contexts. Taught in Spanish.
Prerequisite: SPAN331, SPAN332, or SPAN333; or students who have taken courses with comparable content may contact the department; or permission of ARHU-Spanish & Portuguese Languages & Literatures department.
Cross-listed with: CINE427.
Credit Only Granted for: CINE427, FILM427 or SPAN427.
Formerly: FILM427.

SPAN431 Mexican Women Writers (3 Credits)
Focuses on Mexican women writers from the colonial period to the present. It consists of various types of texts, including poetry, short story, essay, and novel. Its principal themes include the relations among experience, knowledge, and expression; the presence or absence of women in literary histories, including Wikipedia pages; feminism; and the opportunities and challenges presented by the category of women writers. Taught in Spanish.
Prerequisite: SPAN331, SPAN332, SPAN333, SPAN361, SPAN362, or SPAN363; or permission of instructor.

SPAN432 Colonial Latin American Literature (3 Credits)
Examines the key themes, writers, literary movements, and cultural debates of the colonial period.
Prerequisite: SPAN333, SPAN361, SPAN331, SPAN332, SPAN362, or SPAN363.

SPAN433 Women and Culture in Colonial Latin America (3 Credits)
Considers questions of women and historical production, women writers in colonial times, and contemporary literary interpretations of colonial realities. Debates the continued legacy of female archetypes from the colonial period to the present, and epistemological questions regarding the production of knowledge.
Prerequisite: SPAN333, SPAN361, SPAN331, SPAN332, SPAN362, or SPAN363.

SPAN434 The Usable Past: Reflecting on Archives in Contemporary Fictions and Films from the Southern Cone (3 Credits)
Che Guevara on a t-shirt, Eva Peron in a Broadway musical, Bolivar as trans on a postcard, Gabriela Mistral on a peso bill, Pablo Neruda as a postman's friend, Frida Kahlo as a feminist icon, Artigas in a blues band ... The list goes on. Nevertheless, what all these cultural appropriations have in common is that the present has used the past to inscribe a functional narrative for that time. This course will not ask if we can know past events as they really happened, but rather it will explore how contemporary fictions, films, and visual art from the Southern Cone construct usable cultural archives for their present. Also, this seminar traces the ways in which contemporary authors, filmmakers, and visual artists reflect on the past in order to critically read their present. Concentrating on the past as both the subject of fiction and as a force for inscribing fiction, this seminar inscribes an approach to time that moves away from a linearity.
Prerequisite: SPAN331, SPAN332, SPAN333, SPAN361, SPAN362, or SPAN363; or permission of instructor.
Credit Only Granted for: SPAN434 or SPAN408F.
Formerly: SPAN408F.
Additional Information: Taught in Spanish.

SPAN435 Ecuador: Andean Spaces-Traversing the Colonial City and the Natural World (3 Credits)
Introduces students to the history and cultures of Ecuador from the colonial period to the beginning of the 19th century. By studying the socio-spatial configuration of the colonial city as exemplified by Quito, students will be immersed in the art, architecture, and other rich cultural legacies of Ecuador. Quito, a World Heritage site, offers students visually stunning churches, monasteries, colonial squares, a famed tradition of Baroque painting and sculptures, and vibrant indigenous and mestizo communities. As a contrast, students will explore also travel narratives that represent the natural Andean world while visiting Quito's surrounding areas. This course will interrogate the European influence on urban design and representations of the landscape of the Americas. Understanding this colonial past enhances the understanding of the modern history of the Andean region and Latin America as a whole. The students will gain a full appreciation of the European and Indigenous living heritage that composes the region today. Taught in English.
Cross-listed with: ARTH472.
Credit Only Granted for: SPAN435, SPAN448E, ARTH472 or ARTH369E.
Formerly: SPAN448E and ARTH369E.

SPAN436 Representations of Childhood and Youth in Latin American Literature and Film (3 Credits)
Focuses on the representation of childhood and youth in films and works of fiction from various regions of the Spanish-speaking Americas, including Mexico, the Caribbean, the US, and Peru. We are going to read various short stories and novels, and watch two films, all of which develop in different ways the topics of childhood and youth. Taught in Spanish.
Prerequisite: SPAN331, SPAN332, SPAN333, SPAN361, SPAN362, or SPAN363; or permission of instructor.

SPAN437 Love, Science, Religion and the Pursuit of Criollo Independence in 18th-Century Mexico (3 Credits)
Explores the 18th century from the periphery of traditionally studied centers of Enlightenment. By focusing on pre-independence Mexico, we will study the emergence of alternative scientific and religious discourses in an American context that leads to social and political changes at the onset of the 19th century. Students will watch the Mexican telenovela "Alborada" (2005-6), which fictionally explores many of the topics that are relevant for the course. Students will also read a variety of materials on the following subtopics: imperial designs, cultural production, inquisitional realities, medical discourse, individual and political rights, criollo consciousness, etc. All writing and discussion will be in Spanish. Taught in Spanish.
Prerequisite: SPAN331, SPAN332, SPAN333, SPAN361, SPAN362, or SPAN363; or permission of instructor.

SPAN438 Special Topics in Colonial Latin America (3 Credits)
The conquest and colonization of the New World produced a textual corpus of invaluable importance for the foundation of Spanish American literary tradition. Special topics (themes, authors, debates, etc.) relevant to the Colonial period will be addressed.
Prerequisite: SPAN333, SPAN361, SPAN331, SPAN332, SPAN362, or SPAN363.
Repeatable to: 9 credits if content differs.

SPAN440 Speaking Up/Out: Women Writers and Feminist Social Movements in Contemporary Latin America (3 Credits)
This seminar will explore how feminist subversion of naturalized power relationships has become a social force that is reshaping Latin American culture in the last several decades. Also, we will study how contemporary cultural artifacts contest value systems while rejecting entrenched hierarchies and norms. By reading contemporary women writers and by working on contemporary feminist social movements, this course will explore what the anthropologist Rita Segato has defined as "the war against women." Taught in Spanish.
Prerequisite: SPAN331, SPAN332, SPAN333, SPAN361, SPAN362, or SPAN363; or permission of instructor.

SPAN442 Detective Fiction in Latin America (3 Credits)
Focuses on Latin American detective fiction, including novels and short stories, whodunits and thrillers. Detective fiction's origins are primarily from outside of Latin America. Therefore the course will also include important texts from other traditions, including the US, English, and French. Taught in Spanish.
Prerequisite: SPAN303; and SPAN311 or SPAN316; and one from (SPAN331, SPAN332, SPAN333, SPAN361, SPAN362, or SPAN363) or permission of instructor.

SPAN448 Special Topics in Latin American Civilization (3 Credits)
Intensive independent study of a selected topic related to Latin American civilization.
Prerequisite: SPAN333, SPAN361, SPAN331, SPAN332, SPAN362, or SPAN363.
Repeatable to: 6 credits if content differs.

SPAN449 Special Topics in Spanish Civilization (3 Credits)
An intensive study of a selected topic related to Spanish civilization.
Prerequisite: SPAN333, SPAN361, SPAN331, SPAN332, SPAN362, or SPAN363.
Repeatable to: 6 credits if content differs.

SPAN450 The Hispanic Caribbean: What is a Beach? (3 Credits)
Explores the Hispanic Caribbean as "island spaces" of multiple migrations and cultural identities, as sites of colonial experiences and post-colonial debates.
Prerequisite: SPAN333, SPAN361, SPAN331, SPAN332, SPAN362, or SPAN363.

SPAN451 Paradise Lost: Cuban Cinematic Culture (3 Credits)
Explores the cinematic journey of the Cuban revolution from socialist utopia to bitter disillusionment. Taking as a point of departure the national postulates of an "Imperfect Cinema" and the different theorizations of "New Latin American cinema," the course will concentrate on the emergence and development of Cuban cinematic culture that has taken place during the revolution. Our objective is to explore how art and politics collide to reveal contested visions of a social process. Visual materials will include films and documentaries. Readings will include selections from historiographic and literary works, as well as contemporary critical studies.
Prerequisite: One course from SPAN331, SPAN332, SPAN333, SPAN361, SPAN362, or SPAN363; or permission of instructor.
Credit Only Granted for: SPAN451, CINE429W or SPAN408P.
Formerly: SPAN408P.

SPAN452 Reflecting on Neoliberalism and Contemporary Southern Cone Culture (3 Credits)
An exploration of how neoliberalism and its market-driven economy have shaped Latin American culture of the last decades. In particular, we will explore how contemporary cultural artifacts are inscribed into a value system that quantifies the unquantifiable, that is to say, a system that only values a book or an artist based on sales. In this class, we will work with a variety of cultural artifacts from Argentina, Chile, and Uruguay--films, chronicles, music, newspapers, cartoons, literature, and documentaries--to map how culture and markets intersect. Taught in Spanish.
Prerequisite: SPAN331, SPAN332, SPAN333, SPAN361, SPAN362, or SPAN363; or permission of instructor.

SPAN453 Seeking Adventure and Glory: Don Quixote (3 Credits)
Widely acknowledged as the first modern novel, Don Quixote tells the story of a middle-aged Spanish gentleman who, obsessed with the chivalrous ideals found in romantic tales, decides to take up his lance and sword to defend the helpless and destroy the wicked. Seated upon his horse Rocinante and accompanied by his loyal squire Sancho Panza, Don Quixote sets out on the roads of Spain seeking adventure and glory. The course will consist of a close reading of Don Quixote. We will analyze and comment on the novel at the literal and historical levels, as well as in its symbolic and widely anthropological dimensions. We will also establish a dialogue between Don Quixote and the narrative and philosophical traditions of Europe, United States and Latin America. Taught in Spanish.
Prerequisite: One of the following: SPAN331, SPAN332, SPAN333, SPAN361, SPAN362, or SPAN363; or permission of instructor.
Credit Only Granted for: SPAN430 or SPAN453.
Formerly: SPAN430.

SPAN456 Construction of Gender and Sexuality in the Spanish Realist-Naturalist Novel (3 Credits)
Examines 19th-century Spanish normative notions regarding gender expression and identities as well as men's and women's sexualities in the Realist and Naturalist novel. Also, we will discuss representations of men and women whose behavior ran afoul of a heteronormative system that valued domestic privacy as a space of honor and virtuous masculinity and femininity. Taught in Spanish.
Prerequisite: One of the following: SPAN331, SPAN332, SPAN333, SPAN361, SPAN362, or SPAN363; or permission of instructor.
Recommended: SPAN333.

SPAN457 Comedy, Foppery, and Foreignness in Eighteenth-Century Spain (3 Credits)
We will explore the comical and satirical elements in 18th-century Spanish literary works, situating them within the social and historical context of the aesthetic tastes of the Spanish reading public and how those tastes impacted the production of literature and other cultural artifacts. Taught in Spanish.
Prerequisite: One of the following: SPAN331, SPAN332, SPAN333, SPAN361, SPAN362, or SPAN363; or permission of instructor.
Recommended: SPAN333.

SPAN460 The Sublime and the Grotesque in Spanish Romantic Plays and the Visual Arts (3 Credits)
An exploration of the notions of the sublime and the grotesque in theatrical works as well as in the visual arts of the Romantic movement in Spain. Taught in Spanish.
Prerequisite: SPAN331, SPAN332, SPAN333, SPAN361, SPAN362, or SPAN363; or permission of instructor.

SPAN461 Queer Spain (3 Credits)
Explores discursive representations of Spaniards who were judged as non-normative by their society during the modern and contemporary period. Putting a critical lens to various cultural artifacts (visual arts, fiction, film, and journalism), we will interrogate what it means to be "(ab)normal" in terms of gender expression, erotic desire, sexuality, and anatomical sex in Spain at critical junctures in modern history. Taught in Spanish.
Prerequisite: One of the following: SPAN331, SPAN332, SPAN333, SPAN361, SPAN362 or SPAN363; or permission of instructor.
Recommended: SPAN333.

SPAN462 Twentieth Century Drama (3 Credits)
Significant plays of the twentieth century.
Prerequisite: SPAN333, SPAN361, SPAN331, SPAN332, SPAN362, or SPAN363.

SPAN463 Cultural Artifacts of Contemporary Spanish Crises from 1898 to the COVID Pandemic (3 Credits)
An overview of Spain from the end of the 19th century through the present day and studies some of its main crises. The course explores the production of literary, cultural, and cinematic texts in their sociohistorical, political, religious and cultural contexts and development. This interdisciplinary course covers topics such as political, historical, religious, racial, ethnic, gendered/sexual, cultural, and ethno-geographical, literary and cinematic diversities and differences in Contemporary Spain. Taught in Spanish.
Prerequisite: SPAN331, SPAN332, SPAN333, SPAN361, SPAN362, or SPAN363; or permission of instructor.

SPAN464 Contemporary Spanish Poetry (3 Credits)
Spanish poetry from the generation of 1927 to the present.
Prerequisite: SPAN333, SPAN361, SPAN331, SPAN332, SPAN362, or SPAN363.

SPAN465 Spanish Exiles and Totalitarianisms (3 Credits)
An overview of the cultural and literary production regarding the Spanish Civil War (1936-1939) and its aftermath in the context of political exile from the early 20th century through present-day Spain. The course explores the production of literary texts in their sociohistorical, political, and cultural contexts and development as a reflection of that crisis in the conscience of present-day Spain. This interdisciplinary course covers topics such as political, historical, religious, racial, ethnic, gendered/sexual, cultural, and ethno-geographical diversities and differences concerning the Spanish Civil War and its aftermath. Taught in Spanish.
Prerequisite: SPAN331, SPAN332, SPAN333, SPAN361, SPAN362, or SPAN363; or permission of instructor.
Recommended: SPAN333.

SPAN466 The Contemporary Spanish Novel (3 Credits)
The novel and the short story from 1940 to the present.
Prerequisite: SPAN333, SPAN361, SPAN331, SPAN332, SPAN362, or SPAN363.

SPAN467 Visions and Fictions from Spain (3 Credits)
Overview of Spanish cinema from the end of the 19th century through present day Spain. Exploration of the production of literary and cinematic texts in their social, historical, political, religious, and cultural contexts.
Prerequisite: One course from SPAN331, SPAN332, SPAN333, SPAN361, SPAN362 or SPAN363; or permission of instructor.
Recommended: SPAN333.
Cross-listed with: CINE467.
Credit Only Granted for: CINE427, CINE467, FILM427, SPAN427, or SPAN467.
Formerly: FILM427, CINE427, and SPAN427.

SPAN468 Modernism and Post-Modernism in Spain and Spanish-America (3 Credits)
A study of the most important works and authors of both movements in Spain and Spanish-America.
Prerequisite: SPAN333, SPAN361, SPAN331, SPAN332, SPAN362, or SPAN363.
Repeatable to: 9 credits if content differs.

SPAN469 Study Abroad Special Topics IV (1-6 Credits)
Special topics course taken as part of an approved study abroad program.
Repeatable to: 15 credits if content differs.

SPAN471 United States Latina Fiction (3 Credits)
An introduction to United States latina fiction through the study of short stories, novels, poetry, etc. It explores strategies of representation by women of color.
Prerequisite: SPAN333, SPAN361, SPAN331, SPAN332, SPAN362, or SPAN363.

SPAN472 Latina/o Communities and Language Struggles (3 Credits)
Explores the history of Latina/o communities and their language "choices," negotiations, and struggles in the United States, starting with the Spanish conquest of North America through the 21st century. We examine the lasting impact of the War of 1848 by which the U.S. colonized the southwest and consider how the Spanish-American War of 1898 imposed U.S. rule in the Hispanophone Caribbean. In this context of struggle, we examine how language repression and expression gave voice to the Latinx civil rights movements in the 1960s and 1970s as well as current immigration and education movements. Texts include Spanish cronicas, U.S. political treaties, the Hispanic press, manifestos, novels, poetry, spoken word, film, music, among others. Course format consists of lectures, discussions, group work, short essays, presentations, and examinations. Students should expect to participate in a community engagement project. Taught in Spanish and discussions in Spanglish.
Prerequisite: SPAN331, SPAN332, SPAN333, SPAN361, SPAN362, or SPAN363; or permission of the instructor.
Credit Only Granted for: SPAN408T or SPAN472.
Formerly: SPAN408T.

SPAN473 U.S. Latino Performance (3 Credits)
An introduction to United States Latino Performance texts by Chicano, Nuyorican, Cuban-American, Dominican, Central-American and others.
Prerequisite: SPAN333, SPAN361, SPAN331, SPAN332, SPAN362, or SPAN363.

SPAN474 Central American Literatures, Cultures, and Histories (3 Credits)
An overview of Central American history and cultural production, focusing primarily but not exclusively on literary texts.
Prerequisite: SPAN333, SPAN361, SPAN331, SPAN332, SPAN362, or SPAN363.

SPAN475 Central America: 21st-Century Literature & Culture (3 Credits)
Explores the discursive construction of Central America in the 21st century, from banana republic to northern triangle. While we study issues of violence, crime, feminicide, impunity, corruption, migration, human and drug trafficking, and climate change, we will moreover focus on people's struggles for equality, human rights, environmental justice, food security, healthcare, education, and employment in the region. We seek to understand the root cause of local and global conditions in Central America as well as the creative and resilient ways that Central Americans respond to them. Texts include novels, short stories, cronicas, news, films, photography, and other re/sources. Course format consists of lectures, discussions, group work, short essays, presentations, and examinations. Students should expect to participate in a community engagement project. Taught in Spanish and discussions in Spanglish.
Prerequisite: SPAN331, SPAN332, SPAN333, SPAN361, SPAN362, or SPAN363; or permission of instructor.
Credit Only Granted for: SPAN408L or SPAN475.
Formerly: SPAN408L.

SPAN476 Central Americans in the DMV (3 Credits)
Explores the history, migration, and cultural representation of Central Americans in the DMV (DC, Maryland, and Virginia) in the larger context of transnational relations between Central America and the United States. We ask how and why the DMV is home to one of the largest concentrations of Central Americans, especially Salvadorans, in the nation, as well as examine the diaspora as a transnational process. We study plays, short stories, poetry, spoken word/ performances, films, music, photography, zines, social media, and other interdisciplinary re/ sources, and engage one-on-one with local and international artists, activists, and community organizations. Course format consists of lectures, discussions, group work, short essays, presentations, and examinations. Students should expect to participate in a community engagement project. Taught in Spanish and discussions in Spanglish.
Prerequisite: SPAN331, SPAN332, SPAN333, SPAN361, SPAN362, or SPAN363; or permission of instructor.
Credit Only Granted for: SPAN408W or SPAN476.
Formerly: SPAN408W.

SPAN477 Between Worlds: Central American Diasporas (3 Credits)
Examines Central America as a locus of diasporas, from its geological formation as an isthmus to the current movement of peoples across El Salvador, Guatemala, Nicaragua, Honduras, Costa Rica, Panama, Belize, and beyond. It offers a broadscale view of Central American societies, histories, (geo)politics, social and revolutionary movements, and cultural and literary production, and situates diasporic literature in relation to migration, war, genocide, violence, transnationalism, globalization, among others. Because the Washington, D.C. Metropolitan Area is a significant site of the Central American diasporas, we will explore our particular location and engage with local diasporic communities. Course format consists of lectures, discussions, group work, short essays, presentations, and examinations. Students should expect to participate in a community engagement project. Taught in Spanish and discussions in Spanglish.
Prerequisite: SPAN331, SPAN332, SPAN333, SPAN361, SPAN362, or SPAN363; or permission of instructor.
Credit Only Granted for: SPAN408R or SPAN477.
Formerly: SPAN408R.

SPAN478 Special Topics in United States Latino Cultures (3 Credits)
Explores special topics in US Latino Cultures, ranging from Chicano, Nuyorican, Cuban-American, Dominican, Central-American and other border cultural identities.
Prerequisite: SPAN333, SPAN361, SPAN331, SPAN332, SPAN362, or SPAN363.
Repeatable to: 9 credits if content differs.

SPAN479 Honors Thesis (3-6 Credits)
Researching and writing an honors thesis under the direction of a professor.
Restriction: Must be in Spanish and Portuguese Honors.
Repeatable to: 6 credits if content differs.

SPAN480 Spanish for Business II (3 Credits)
Business Spanish terminology, vocabulary and practice. Emphasis on everyday spoken and written Spanish. Readings and discussions of international topics. Cross-cultural considerations relative to international business operations, including exporting and banking. Taught in Spanish.
Prerequisite: Must have completed SPAN370.
Restriction: Sophomore standing or higher.
Credit Only Granted for: SPAN470 or SPAN480.

SPAN495 Honors Reading (3 Credits)
Supervised reading.
Prerequisite: Must be in Spanish and Portuguese Honors; or permission of ARHU-School of Languages, Literatures, and Cultures department.

SPAX - Spanish Education Abroad

SPAX100 Intensive Elementary Spanish I A1 (6 Credits)
This intensive introductory course offers significant exposure to the Spanish language and creates many opportunities to practice language skills. The course covers an introduction to the Spanish alphabet and fundamental skills including reading, writing, listening, and speaking. Students will be able to introduce themselves and be familiar with everyday expressions and basic phrases.
Additional Information: This course is offered as part of the Maryland-in-Barcelona study abroad program. Students must apply for this program through Education Abroad: More information at ter.ps/UMBarcelona. Education Abroad processes registrations for this course on behalf of students.

SPAX101 Elementary Spanish I A1 (3 Credits)
This introductory course covers an introduction to the Spanish alphabet and fundamental skills including reading, writing, listening, and speaking. Students will be able to introduce themselves and be familiar with everyday expressions and basic phrases.
Additional Information: This course is offered as part of the Maryland-in-Barcelona study abroad program. Students must apply for this program through Education Abroad: More information at ter.ps/UMBarcelona. Education Abroad processes registrations for this course on behalf of students.

SPAX102 Intensive Elementary Spanish II A2 (6 Credits)
This intensive elementary course offers significant exposure to the Spanish language and creates many opportunities to practice language skills. The course covers Spanish language intonations, reading, writing, listening, and conversational Spanish. Students will be able to understand sentences and frequently used expressions related to areas of most immediate relevance.
Additional Information: This course is offered as part of the Maryland-in-Barcelona study abroad program. Students must apply for this program through Education Abroad: More information at ter.ps/UMBarcelona. Education Abroad processes registrations for this course on behalf of students.

SPAX103 Elementary Spanish II A2 (3 Credits)
This course covers Spanish language intonations, reading, writing, listening, and conversational Spanish. Students will be able to understand sentences and frequently used expressions related to areas of most immediate relevance.
Additional Information: This course is offered as part of the Maryland-in-Barcelona study abroad program. Students must apply for this program through Education Abroad: More information at ter.ps/UMBarcelona. Education Abroad processes registrations for this course on behalf of students.

SPAX104 Beginner Spanish (6 Credits)
Beginner level course, corresponding to level A1 of the Common European Framework of Reference for Languages which aims, from a communicative perspective, to develop fundamental linguistic skills in an integrated and significant way (listening, reading, speaking and writing). Moreover, the course has a strong focus on lexical and grammatical content whilst always seeking to respond effectively to the communicative and academic needs of the students.
Credit Only Granted for: SPAX104 or SPAN1690.
Additional Information: This course is offered as part of the Maryland-in-Barcelona study abroad program. Students must apply for this program through Education Abroad: More information at ter.ps/UMBarcelona. Education Abroad processes registrations for this course on behalf of students.

SPAX200 Intensive Intermediate Spanish I B1.1 (6 Credits)
This intensive intermediate course offers significant exposure to the Spanish language and creates many opportunities to practice language skills. The course covers pronunciation, expression, reading comprehension, writing, and culture of the Spanish-speaking world. Students will be able to deal with most situations likely to arise while travelling in a Spanish-speaking region and produce simple connected text on topics that are familiar or of personal interest.
Additional Information: This course is offered as part of the Maryland-in-Barcelona study abroad program. Students must apply for this program through Education Abroad: More information at ter.ps/UMBarcelona. Education Abroad processes registrations for this course on behalf of students.

SPAX201 Intermediate Spanish I B1.1 (3 Credits)
This intermediate course covers pronunciation, expression, reading comprehension, writing, and culture of the Spanish-speaking world. Students will be able to deal with most situations likely to arise while travelling in a Spanish-speaking region and produce simple connected text on topics that are familiar or of personal interest.
Additional Information: This course is offered as part of the Maryland-in-Barcelona study abroad program. Students must apply for this program through Education Abroad: More information at ter.ps/UMBarcelona. Education Abroad processes registrations for this course on behalf of students.

SPAX202 Intensive Intermediate Spanish II B1.2 (6 Credits)
This intensive intermediate course offers significant exposure to the Spanish language and creates many opportunities to practice language skills. The course covers communicating with confidence, understanding and writing short texts, and various grammatical structures. Students will be able to describe experiences and events, dreams, hopes and ambitions and briefly give reasons and explanations for opinions and plans.
Additional Information: This course is offered as part of the Maryland-in-Barcelona study abroad program. Students must apply for this program through Education Abroad: More information at ter.ps/UMBarcelona. Education Abroad processes registrations for this course on behalf of students.

SPAX203 Intermediate Spanish II B1.2 (3 Credits)
This intermediate course covers communicating with confidence, understanding and writing short texts, and various grammatical structures. Students will be able to describe experiences and events, dreams, hopes and ambitions and briefly give reasons and explanations for opinions and plans.
Additional Information: This course is offered as part of the Maryland-in-Barcelona study abroad program. Students must apply for this program through Education Abroad: More information at ter.ps/UMBarcelona. Education Abroad processes registrations for this course on behalf of students.

SPAX300 Intensive Upper Intermediate Spanish I B2.1 (6 Credits)
This intensive upper intermediate course offers significant exposure to the Spanish language and creates many opportunities to practice language skills. The course covers more advanced reading and listening comprehension, with a focus on Spanish and Latin American authors; covers more advanced speaking, such as discussions and debates, as well as writing letters, reports, and essays. Students will be able to produce clear, detailed text on a wide range of subjects and explain a viewpoint on a topical issue giving the advantages and disadvantages of various options.
Additional Information: This course is offered as part of the Maryland-in-Barcelona study abroad program. Students must apply for this program through Education Abroad: More information at ter.ps/UMBarcelona. Education Abroad processes registrations for this course on behalf of students.

SPAX301 Upper Intermediate Spanish I B2.1 (3 Credits)
This upper intermediate course covers more advanced reading and listening comprehension, with a focus on Spanish and Latin American authors; covers more advanced speaking, such as discussions and debates, as well as writing letters, reports, and essays. Students will be able to produce clear, detailed text on a wide range of subjects and explain a viewpoint on a topical issue giving the advantages and disadvantages of various options.
Additional Information: This course is offered as part of the Maryland-in-Barcelona study abroad program. Students must apply for this program through Education Abroad: More information at ter.ps/UMBarcelona. Education Abroad processes registrations for this course on behalf of students.

SPAX302 Intensive Upper Intermediate Spanish II B2.2 (6 Credits)
This intensive upper intermediate course offers significant exposure to the Spanish language and creates many opportunities to practice language skills. Students will be able to take part in conversations with native speakers with little or no difficulty and no grammatical errors and using acceptable pronunciation. Students achieving this level are able to handle literary texts and documents on any subject in their field of interest, and write complex texts with very few errors.
Additional Information: This course is offered as part of the Maryland-in-Barcelona study abroad program. Students must apply for this program through Education Abroad: More information at ter.ps/UMBarcelona. Education Abroad processes registrations for this course on behalf of students.

SPAX303 Upper Intermediate Spanish II B2.2 (3 Credits)
This upper intermediate course will allow students to be able to take part in conversations with native speakers with little or no difficulty and no grammatical errors and using acceptable pronunciation. Students achieving this level are able to handle literary texts and documents on any subject in their field of interest, and write complex texts with very few errors.
Additional Information: This course is offered as part of the Maryland-in-Barcelona study abroad program. Students must apply for this program through Education Abroad: More information at ter.ps/UMBarcelona. Education Abroad processes registrations for this course on behalf of students.

SPAX306 Intensive Advanced Spanish I C1.1 (6 Credits)
This intensive advanced course offers significant exposure to the Spanish language and creates many opportunities to practice language skills. Students will be able to understand a wide range of demanding, longer clauses, and recognize implicit meaning as well as express ideas fluently and spontaneously without much obvious searching for expressions.
Additional Information: This course is offered as part of the Maryland-in-Barcelona study abroad program. Students must apply for this program through Education Abroad: More information at ter.ps/UMBarcelona. Education Abroad processes registrations for this course on behalf of students.

SPAX307 Intensive Advanced Spanish II C1.2 (6 Credits)
This intensive advanced course offers significant exposure to the Spanish language and creates many opportunities to practice language skills. Students will be able to use language flexibly and effectively for social, academic and professional purposes as well as produce clear, well-structured, detailed text on complex subjects, showing controlled use of organizational patterns, connectors and cohesive devices.
Additional Information: This course is offered as part of the Maryland-in-Barcelona study abroad program. Students must apply for this program through Education Abroad: More information at ter.ps/UMBarcelona. Education Abroad processes registrations for this course on behalf of students.

SPAX312 Spanish Conversation and Oral Skills I (3 Credits)
Augments student linguistic competence with a special focus on oral skills and linguistic functions. Students will develop the oral abilities and strategies needed to accomplish meaningful interactions with people from the local community with ease and confidence.
Additional Information: This course is offered as part of the USAC Chile study abroad program. Students must apply for this program through Education Abroad: More information at https://globalmaryland.umd.edu/offices/education-abroad/program/10009. Education Abroad processes registrations for this course on behalf of students.

SPAX315 Advanced Spanish II (3 Credits)
Designed for students who may manage in daily tasks and interactions, but still need to improve their control over different oral and written registers. In addition, offers the opportunity to enhance vocabulary in specific and technical areas, and to improve grammatical accuracy in their oral and written expression.
Additional Information: This course is offered as part of the USAC Chile study abroad program. Students must apply for this program through Education Abroad. Education Abroad processes registrations for this course on behalf of students.

SPAX317 International Business and the European Union (3 Credits)
Analyzes the division between EU and non EU parts of Europe. Explores that this division exists because the Europe of the 15 has the buying power, while the Europe of the 10 is the ideal place for direct foreign investments, principally from North America. Examines into the involvement of the European Union in international business and global competition as fundamental to the functioning of the global economy.
Additional Information: This course is offered as part of the Maryland-in-Sevilla study abroad program. Students must apply for this program through Education Abroad: More information at ter.ps/UMSevilla. Education Abroad processes registrations for this course on behalf of students.

SPAX325 Advanced Present-Day Spanish Usage (3 Credits)
This course is active and communicative in nature, with activities requiring use of the language learned. Follows a process based on communicative and pedagogical activities integrating skills of interaction and oral and written expression, oriented toward obtaining a greater lexical and semantic competency. Works mainly with authentic texts from various sources, including newspaper articles, literary passages, audios, movies, videos, publicity, webpages and emails. Skills of language reception and emission taught in an integrated manner (written and oral interaction, listening and reading comprehension, spoken and written expression).
Additional Information: This course is offered as part of the Maryland-in-Sevilla study abroad program. Students must apply for this program through Education Abroad. Education Abroad processes registrations for this course on behalf of students.

SPAX361 Spain and The Americas: From the Pre-Columbian Period to the Present (3 Credits)
Aims to introduce historical, political, social, anthropological and cultural aspects of Spanish-speaking countries in America. Begins with the great civilizations that flourished in America before the Spaniards' arrival. Studies different periods from the initial encounter, conquest, colonization and independence to current times.
Additional Information: This course is offered as part of the Maryland-in-Sevilla study abroad program. Students must apply for this program through Education Abroad: More information at ter.ps/UMSevilla. Education Abroad processes registrations for this course on behalf of students.

SPAX366 Advanced Reading Skills in Spanish (1 Credit)
Analyze the knowledge and strategies of reading abilities, keeping in mind the following points: previous social-cultural knowledge and experiences; reading and learning personal strategies; discursive competence in gender and type of writing, recognizing the structure, capacity to discover the sense upon advancing in reading, and analysis of linguistic elements in speech.
Additional Information: This course is offered as part of the Maryland-in-Sevilla study abroad program. Students must apply for this program through Education Abroad: More information at ter.ps/UMSevilla. Education Abroad processes registrations for this course on behalf of students.

SPAX367 Advanced Academic Writing in Spanish (1 Credit)
Focuses on the written expression. Work on real, contextualized texts that will be used as guides for students to create their own. Skills with a greater implication for daily or professional context are improved, allowing performance in real communication situations. Work with different types of texts. Different activities will be proposed to motivate and implicate production including: printed materials, questionnaires, presentation letters, advertisements, recipes, instructions, invitation and direction letters. Includes aspects of adaption, coherence, cohesion, grammatical correction, variety and style.
Additional Information: This course is offered as part of the Maryland-in-Sevilla study abroad program. Students must apply for this program through Education Abroad: More information at ter.ps/UMSevilla. Education Abroad processes registrations for this course on behalf of students.

SPAX370 Spanish for the Health Professional (3 Credits)
Focuses on the practical and communicative, with a focus on both written and spoken Spanish. Activities are based on situations in work life and related materials. Includes presentation of written and auditory material to immerse students in situations and contextualize vocabulary, activities aimed at increasing and reinforcing specific vocabulary, controlled conversation activities in pairs or small groups, and review of basic grammatical usage.
Additional Information: This course is offered as part of the Maryland-in-Sevilla study abroad program. Students must apply for this program through Education Abroad: More information at ter.ps/UMSevilla. Education Abroad processes registrations for this course on behalf of students.

SPAX403 Mosaic: Jews, Muslims, Christians and the Spanish Experience (3 Credits)
Explains the presence of these cultures in Spain and studies the influences of Jews and Muslims in the country's political, intellectual and artistic life starting at the earliest stages and continuing through the establishment of the Spanish nation as an identity to the present-day.
Additional Information: This course is offered as part of the Maryland-in-Sevilla study abroad program. Students must apply for this program through Education Abroad: More information at ter.ps/UMSevilla. Education Abroad processes registrations for this course on behalf of students.

SPAX404 Women Writers of Spain (3 Credits)
Aims to analyze the role of women in Spanish literature from its origins to our time. See how views of women have changed over time in different works and authors, and how women changed from mere objects of reference to protagonists in authorship. Observe how these characters develop in regard to their setting, noting for example the differences between post-war Catalonian woman who appears in Carmen Laforet's "Nada" and the provincial woman featured in Carmen Martin Gaite's "Entre visillos". The contrasts and evolution of female characters and authors throughout Spanish Literature will form the content of this course. In the process, acquire a broader perspective of Spanish culture from both a social and literary standpoint.
Credit Only Granted for: SPAN425 or SPAX404.
Additional Information: This course is offered as part of the Maryland-in-Sevilla study abroad program. Students must apply for this program through Education Abroad: More information at ter.ps/UMSevilla. Education Abroad processes registrations for this course on behalf of students.

SPAX405 Advanced Studies in Spanish (3 Credits)
Work with different vocabulary and grammatical aspects of the language, both oral and written, that emerge from different activities. Principal aspects of the class will be complemented with other activities such as: dialogues based on different situations; conversations about current events related to Spanish culture; discussions and debates to encourage communication and engage analytical and critical abilities; oral presentations on themes related to Spanish life and culture; lectures on different types of texts pertaining to different linguistic aspects; listening to songs to develop auditory comprehension.
Additional Information: This course is offered as part of the Maryland-in-Sevilla study abroad program. Students must apply for this program through Education Abroad: More information at ter.ps/UMSevilla. Education Abroad processes registrations for this course on behalf of students.

SPHL - Public Health

SPHL100 Foundations of Public Health (3 Credits)
An overview of the goals, functions, and methods of public health. After an introduction to the core concepts and tools used in public health research and practice, applications of these methodologies are considered in the context of current controversies/problems in public health. Students work together to develop strategies for prevention and control that take into consideration different points of view, outside research, and impacts on individuals and communities.
Restriction: Must be in a major in SPHL-School of Public Health.
Credit Only Granted for: SPHL100, PHSC300 or SPHL600.

SPHL240 Public Health Engagement (2 Credits)
Public Health Engagement is a transfer transition course that provides an opportunity for transfer students to engage in the professional culture of the public health field and to build community while navigating a large, public institution. Instructors use research, physical activity, and academic engagement to stimulate community building across all majors within the School of Public Health. Students will engage with public health issues, academic resources, solution-driven grant writing, identity development, faculty and alumni support systems, and group and individual physical activities. A partnership of 3 sectors within the school, this course is taught by an interdisciplinary team fostering public health practice and community building while promoting successful transition, integration and retention.
Restriction: Must be a transfer student with 60 credits or less; and must be in a major in SPHL-School of Public Health.
Additional Information: The course will include a significant physical activity component.

SPHL246 Level Up: Unlock Your Academic Achievements (1 Credit)
This lab course is designed to assist students in improving academic strategies, learning time management practices, interacting with the faculty and greater campus community, and developing professional career aspirations. The focus will be on an exploration of the academic environment, campus resources, self-discovery tools, and skill development. Utilizing an interactive experience through facilitated discussion that develops positive relationships, students will actively explore academic opportunities offered through the School of Public Health and the University of Maryland.
Restriction: Students must be undergraduate majors within the School of Public Health; and permission of instructor.

SPHL260 Public Health Beyond Borders: Designing Culturally Competent Global Projects (3 Credits)
The skills learned in this course are intended to engage students in critical thinking prior to a study abroad, global health project, or other international service experience in such a way that adds depth for the student and minimizes unintended negative consequences for local communities. The course is designed in three parts to prepare students to think critically about reciprocity in international service projects and develop scholarship in practice. Community members are viewed as partners, educators, and trusted advisors. Furthermore, since global health projects begin long before the plane lands, money is exchanged, and the first of many plastic bottles of water is purchased, the course begins with broad definitions of key concepts to heighten awareness of unintended consequences of well-meaning volunteers, then leads students through reflection and writing to apply these concepts and provides opportunity to integrate key concepts into plans for projects that serve global communities with cultural competence. Students will explore the needs of global communities, design interventions, and reflect on the potential outcomes in improving health in the communities served, while also focusing on their own subjective experience.

SPHL291 Does Science Support Nontraditional Healing Practices? (3 Credits)
Does yoga improve the health of wounded warriors and/or breast cancer survivors? Can mindfulness enhance your business success and family relationships, or is it social media hype? Do you know what reflexology is, and does it help reduce your personal stress level? Increasing numbers of people are using nutritional supplements, meditation, yoga and other forms of exercise, acupuncture and experiences in nature to reduce stress levels and improve overall health and well-being. In the media, scientists to celebrities have alternately endorsed or rejected claims about how these and other nontraditional health practices benefit health and well-being. Students will sample some of these nontraditional health practices and explore whether these practices can enhance their own well-being. General scientific methods for health research will be introduced and students will use this knowledge to evaluate the existing scientific research on these practices. Students will also evaluate whether popular and media translation of scientific research on these practices is fact-based.
Recommended: Successful completion of English composition course.

SPHL298 SPH Ambassador Program (1 Credit)
The purpose of this course is to train students in the methods related to advising, teaching and leading undergraduate current and prospective students. At the end of the course ambassdors will be a resource to these new students in SPH through their knowledge of academic planning, college/university policy, and understanding of what SPH has to offer. Ambassados will have experience working one on one with students who have academic advising questions and concerns. They will develop better public speaking skills and know how to impart new information in an effective way to undergraduate students.
Restriction: Must be in a major in SPHL-School of Public Health; and minimum cumulative GPA of 2.7; and must have earned less then 90 credits.
Repeatable to: 6 credits.

SPHL321 Terrapin Think Tank (1 Credit)
Serves as a broad introduction to Terrapin Think Tank. Students will learn the basic core competencies we use in health policy research, advocacy, and evaluation. Students will be introduced to policy structures at county- and state-level, key players, and best practices in designing policies and interventions that are sustainable and truly community-centric. Students will also have the opportunity to build out an original initiative, program, or piece of legislation over the course of the semester which will culminate in a final presentation with community and faculty leaders.

SPHL333 Fundamentals of Undergraduate Teaching for Education Assistants and Mentors (UTEAM) (1 Credit)
Supports the professional and personal development of UG students in the UTEAM program. Must be completed concurrently with the first semester of providing UTEAM support to a specific course. UTEAM members are dedicated student learners who provide peer education support for specific course as part of the teaching team and emphasizes: 1) introduction to teaching, learning, literature and practice, 2) collaboration with other UTEAM members, faculty and staff as a learning community, and 3) reflection on the knowledge and skills developed through course participation.
Corequisite: SPHL399.
Restriction: Permission of the instructor; and permission of the School of Public Health.
Additional Information: This course must be taken concurrently with SPHL399 the first term in which a student is a UTA. Preference is given to students within an SPHL major.

SPHL386 Experiential Learning (3 Credits)
Prerequisite: Permission of SPHL-School of Public Health.

SPHL399 Academic Peer Teaching and Mentoring in Public Health (1-3 Credits)
An independent study course for the Undergraduate Teaching and Mentoring (UTEAM) program within the School of Public Health. Students will apply evidence-based research while assisting peers with the understanding and application of course content. Specific responsibilities may vary dependent upon the course instructor. The primary roles of the UTEAM members will be to provide in-class support and/or external course support through review sessions, discussions sessions, laboratory support, group tutoring and office hours.
Corequisite: If this course is being taken for the first time, students must concurrently register for SPHL333.
Restriction: Permission of the instructor; and permission of the School of Public Health.
Repeatable to: 6 credits if content differs.
Additional Information: Preference is given to students within an SPHL major.

SPHL478 Special Topics in Public Health (1-4 Credits)
Special topics in the field of public health.
Repeatable to: 8 credits if content differs.

SPHL488 Children's Health and Development Clinic (1-4 Credits)
An opportunity to acquire training and experience in a therapeutically oriented physical education-recreation program for children referred by various education, special education, medical or psychiatric groups.
Prerequisite: Permission of SPHL-School of Public Health.

SPHL498 Special Topics in Public Health (3 Credits)
Topical and interdisciplinary courses of interest to upper level undergraduate students in the field of Public Health not currently covered by the program.
Restriction: Junior standing or higher.
Repeatable to: 9 credits if content differs.
Credit Only Granted for: SPHL498 or SPHL698 of same suffix.

STAT - Statistics and Probability

STAT100 Elementary Statistics and Probability (3 Credits)
Simplest tests of statistical hypotheses; applications to before-and-after and matched pair studies. Events, probability, combinations, independence. Binomial probabilities, confidence limits. Random variables, expected values, median, variance. Tests based on ranks. Law of large numbers, normal approximation. Estimates of mean and variance.
Prerequisite: MATH107, MATH113, or MATH115 with a C- or better; or permission of CMNS-Mathematics department; or must have math eligibility of STAT100 or higher and math eligibility is based on the Math Placement Exam or the successful completion of Math 003 with appropriate eligibility.
Cross-listed with: DATA100.
Restriction: Must not have completed MATH111; or must not have completed any STAT course with a prerequisite of MATH141.
Credit Only Granted for: DATA100 or STAT100.

STAT110 Applications of R for Data Science (1 Credit)
Intended to prepare students for subsequent courses requiring computation with R, providing powerful and easy to use tools for statistical data analysis. Covers basics of R and R Studio including file handling, data simulation, graphical displays, vector and function operations, probability distributions, and inferential techniques for data analysis.
Prerequisite: DATA100, STAT100, MATH135, or any 400-level STAT course.
Cross-listed with: DATA110.
Credit Only Granted for: STAT110 or DATA110.

STAT386 Experiential Learning (3-6 Credits)
Prerequisite: Must have learning proposal approved by the CMNS-Mathematics Department.

STAT400 Applied Probability and Statistics I (3 Credits)
Random variables, standard distributions, moments, law of large numbers and central limit theorem. Sampling methods, estimation of parameters, testing of hypotheses.
Prerequisite: 1 course with a minimum grade of C- from (MATH131, MATH141); or students who have taken courses with comparable content may contact the department.
Cross-listed with: DATA400.
Credit Only Granted for: DATA400, ENEE324, or STAT400.
Additional Information: Not acceptable toward graduate degrees in MATH/STAT/AMSC.

STAT401 Applied Probability and Statistics II (3 Credits)
Point estimation - unbiased and consistent estimators. Interval estimation. Minimum variance and maximum likelihood estimators. Testing of hypotheses. Regression, correlation and analysis of variance. Sampling distributions. Elements of non-parametric methods.
Prerequisite: 1 course with a minimum grade of C- from (STAT400, STAT410).
Additional Information: Not acceptable toward graduate degrees in MATH/STAT/AMSC.

STAT410 Introduction to Probability Theory (3 Credits)
Probability and its properties. Random variables and distribution functions in one and several dimensions. Moments. Characteristic functions. Limit theorems.
Prerequisite: 1 course with a minimum grade of C- from (MATH240, MATH461, MATH341); and 1 course with a minimum grade of C- from (MATH340, MATH241).
Cross-listed with: SURV410.
Credit Only Granted for: STAT410 or SURV410.

STAT420 Theory and Methods of Statistics (3 Credits)
Point estimation, sufficiency, completeness, Cramer-Rao inequality, maximum likelihood. Confidence intervals for parameters of normal distribution. Hypothesis testing, most powerful tests, likelihood ratio tests. Chi-square tests, analysis of variance, regression, correlation. Nonparametric methods.
Prerequisite: 1 course with a minimum grade of C- from (SURV410, STAT410); and a minimum grade of C- from (MATH410).
Cross-listed with: SURV420.
Credit Only Granted for: STAT420 or SURV420.

STAT422 Probability Models (3 Credits)
Random variables, Joint Distributions, Hierarchical Models, Random Samples, Algorithms for generating samples, Markov Chains, Poisson Processes, Stochastic Processes, Simulations.
Prerequisite: Minimum grade of C- in STAT400 or STAT410.
Credit Only Granted for: STAT498J or STAT422.
Formerly: STAT498J.

STAT426 Introduction to Data Science and Machine Learning (3 Credits)
An introductory course to the recent developments in the fields of data science and machine learning. Emphasis will be given to mathematical and statistical understanding of commonly used methods and processes.
Prerequisite: Minimum grade of C- in MATH241 or MATH340; and minimum grade of C- in MATH240, MATH461 or MATH341; and minimum grade of C- in STAT400 or STAT410; students who have taken courses with content comparable to STAT400/410 may request permission of the instructor.
Credit Only Granted for: STAT426 or CMSC320.

STAT430 Introduction to Statistical Computing with SAS (3 Credits)
Descriptive and inferential statistics. SAS software: numerical and graphical data summaries; merging, sorting and splitting data sets. Least squares, regression, graphics and informal diagnostics, interpreting results. Categorical data, lifetime data, time series. Applications to engineering, life science, business and social science.
Prerequisite: 1 course with a minimum grade of C- from (STAT400, STAT410); and must have completed or be concurrently enrolled in STAT401 or STAT420; students who do not meet the STAT401 or STAT420 requirement but who have taken a statistics course may contact the math department to confirm eligibility.

STAT440 Sampling Theory (3 Credits)
Simple random sampling. Sampling for proportions. Estimation of sample size. Sampling with varying probabilities. Sampling: stratified, systematic, cluster, double, sequential, incomplete.
Prerequisite: 1 course with a minimum grade of C- from (STAT401, STAT420).
Credit Only Granted for: STAT440 or SURV440.

STAT464 Introduction to Biostatistics (3 Credits)
Probabilistic models. Sampling. Some applications of probability in genetics. Experimental designs. Estimation of effects of treatments. Comparative experiments. Fisher-Irwin test. Wilcoxon tests for paired comparisons.
Prerequisite: 1 course with a minimum grade of C- from (MATH120, MATH136, or MATH140);.
Restriction: Junior standing or higher.
Credit Only Granted for: BIOE372 or STAT464.
Additional Information: Not acceptable toward degrees in MATH/STAT.

STAT470 Actuarial Mathematics (3 Credits)
Major mathematical ideas involved in calculation of life insurance premiums, including compound interest and present valuation of future income streams; probability distribution and expected values derived from life tables; the interpolation of probability distributions from values estimated at one-year multiples; the 'Law of Large Numbers' describing the regular probabilistic behavior of large populations of independent individuals; and the detailed calculation of expected present values arising in insurance problems.
Prerequisite: 1 course with a minimum grade of C- from (STAT400 or STAT410); and 1 course with a minimum grade of C- from (MATH340, MATH241).
Recommended: STAT400.

STAT498 Selected Topics in Statistics (1-6 Credits)
Topics of special interest to advanced undergraduate students will be offered occasionally under the general guidance of the MATH/STAT major committee. Students register for reading in statistics under this number.
Restriction: Permission of CMNS-Mathematics department.
Repeatable to: 16 credits.

SURV - Survey and Data Science

SURV400 Fundamentals of Survey and Data Science (3 Credits)
The course introduces the student to a set of principles of survey and data science that are the basis of standard practices in these fields. The course exposes the student to key terminology and concepts of collecting and analyzing data from surveys and other data sources to gain insights and to test hypotheses about the nature of human and social behavior and interaction. It will also present a framework that will allow the student to evaluate the influence of different error sources on the quality of data.
Prerequisite: STAT100; or permission of BSOS-Joint Program in Survey Methodology department.
Restriction: Course open to SURV certificate students, SURV Advanced Special Students, and SURV undergraduate minors. Graduate students from other departments may enroll with permission from the department.
Credit Only Granted for: SURV699M, SDSB340 or SURV400.
Formerly: SURV699M.

SURV410 Introduction to Probability Theory (3 Credits)
Probability and its properties. Random variables and distribution functions in one and several dimensions. Moments. Characteristic functions. Limit theorems.
Prerequisite: 1 course with a minimum grade of C- from (MATH240, MATH461, MATH341); and 1 course with a minimum grade of C- from (MATH340, MATH241).
Cross-listed with: STAT410.
Credit Only Granted for: STAT410 or SURV410.

SURV420 Theory and Methods of Statistics (3 Credits)
Point estimation, sufficiency, completeness, Cramer-Rao inequality, maximum likelihood. Confidence intervals for parameters of normal distribution. Hypothesis testing, most powerful tests, likelihood ratio tests. Chi-square tests, analysis of variance, regression, correlation. Nonparametric methods.
Prerequisite: 1 course with a minimum grade of C- from (SURV410, STAT410); and a minimum grade of C- from (MATH410).
Cross-listed with: STAT420.
Credit Only Granted for: STAT420 or SURV420.

SURV430 Fundamentals of Questionnaire Design (3 Credits)
Introduction to the scientific literature on the design, testing and evaluation of survey questionnaires, together with hands-on application of the methods discussed in class.
Restriction: Permission of BSOS-Joint Program in Survey Methodology department.
Credit Only Granted for: SURV430 or SURV630.

SURV440 Sampling Theory (3 Credits)
Simple random sampling, sampling for proportions, estimation of sample size, sampling with varying probabilities of selection, stratification, systematic selection, cluster sampling, double sampling, and sequential sampling.
Prerequisite: STAT401 or STAT420.
Credit Only Granted for: STAT440 or SURV440.

TDPS - Theatre, Dance and Performance Studies

TDPS201 Introduction to Technical Production (3 Credits)
Students are provided with an overview of topics related to the technical production of theatre and dance including: scenic, prop and costume construction, lighting, sound and video execution and management structures.
Restriction: Must be in a major within the ARHU-Dance department; or must be in a major within the ARHU-Theatre department.
Credit Only Granted for: DANC210 and THET114 or TDPS201.
Formerly: DANC210 and THET114.

TDPS240 Arts Organizations and Audiences in the United States (3 Credits)
An introduction to the history and role of arts organizations in the U.S., as well as the respective audiences and populations they serve. This grounding allows artists and emerging administrators to understand the events and questions that have shaped the field, and develop strategies for advancing sustainable arts organizations in the future.
Cross-listed with: ARHU240.
Credit Only Granted for: TDPS258C, TDSP240 or ARHU240.
Formerly: TDPS258C.

TDPS258 Special Topics in Introductory Performing Arts (1-3 Credits)
Designed for performing arts students. Offers instruction at the introductory level in various aspects of performance such as Voice for the Performing Arts, Movement for the Performing Arts, Acting for the Performing Arts, Partner Dance and a myriad of specific aspects within these genres.
Prerequisite: Permission of ARHU-School of Theatre, Dance & Performance Studies department.
Repeatable to: 9 credits if content differs.

TDPS358 Special Topics in Intermediate Performing Arts (1-3 Credits)
Designed for performing arts students. Offers instruction at the intermediate level in various aspects of performance such as Voice for the Performing Arts, Movement for the Performing Arts, Acting for the Performing Arts, Partner Dance and a myriad of specific aspects within these genres.
Prerequisite: Permission of ARHU-School of Theatre, Dance & Performance Studies department.
Repeatable to: 9 credits if content differs.

TDPS358A Theatre and Dance in Iran and Afghanistan (3 Credits)
Students will learn about stories, plays, and movements in Iran and Afghanistan from past to present. Through watching performances, readings, and discussions, we explore the relationship between storytelling, body, space, and power in forming and performing identity and life experiences. Looking at case studies from traditional, popular, and western style dance and theater are an exciting part of the course. Note: This course requires no prior knowledge of Persian culture or dance and theatre studies on the part of the students.
Cross-listed with: PERS385, THET328W.
Repeatable to: 3 credits if content differs.
Credit Only Granted for: TDPS358A, THET328W, PERS398A, or PERS385.
Formerly: PERS398A.

TDPS362 Alexander Technique (1-3 Credits)
Based on the F.M. Alexander Technique, students will learn to recognize habit patterns that interfere with how they function and express themselves so that they can make conscious choices as a performing artist.
Prerequisite: THET222, THET116, THET223, and TDPS201; or (DANC218 and DANC219). And permission of ARHU-School of Theatre, Dance & Performance Studies department.
Credit Only Granted for: THET399J, THET362 or TDPS362.
Formerly: THET399J and THET362.

TDPS408 Seminar in Theory and Practice of Critical Difference (3 Credits)
This interdisciplinary seminar examines expressive culture as performed in works of dance, theatre, music, and digital media.
Repeatable to: 6 credits if content differs.

TDPS440 Arts Leadership Seminar (3 Credits)
An advanced seminar that connects arts leadership to current trends in technology, demographics, policy, and the economy. Through an investigation of current events, leadership theory, and case studies and guest speakers from the field, students will evaluate arts leadership as a profession and develop their own unique leadership identity. Topics included strategic management, organizational culture, ethics, decision making, and partnerships.
Prerequisite: ARHU240; or permission of instructor.
Cross-listed with: ARHU440.
Credit Only Granted for: ARHU440 or TDPS440.

TDPS441 Arts Entrepreneurship: Theory and Practice (3 Credits)
Establishes arts entrepreneurship as a unique discipline with the goal of connecting creative initiatives (products, artforms, and programs) to audiences, resources, and communities. Introduces students to the ways in which creative initiatives both create value and offer solutions to social, political, environmental, and cultural issues. Students will develop artist impact statements and identify different contexts and ways to apply their talents and creative initiatives in society.
Prerequisite: ARHU240 or TDPS240; or permission of instructor.
Recommended: ARHU440 or TDPS440.
Cross-listed with: ARHU441.
Jointly offered with: ARHU640, TDPS640.
Restriction: Limited to 4 undergraduate students (2 in ARHU and 2 in TDPS).
Credit Only Granted for: TDPS458E, ARHU441, TDPS441, ARHU640 or TDSP640.
Formerly: TDPS458E.

TDPS458 Special Topics in Advanced Performing Arts (1-3 Credits)
Designed for performing arts students. Offers instruction at an advanced level in various aspects of performance such as Voice for the Performing Arts, Movement for the Performing Arts, Acting for the Performing Arts, Partner Dance and a myriad of specific aspects within these genres.
Prerequisite: Permission of ARHU-School of Theatre, Dance & Performance Studies department.
Repeatable to: 9 credits if content differs.

TDPS469 Advanced Practicum in Stage Management (1-3 Credits)
A graded course in stage management for theatre and/or dance productions. A hands-on laboratory experience.
Prerequisite: Minimum of 2 credits from TDPS479.
Restriction: Permission of ARHU-School of Theatre, Dance & Performance Studies department.
Repeatable to: 9 credits.

TDPS470 Production Management (3 Credits)
To familiarize students with techniques and skills required of a Production Manager in a theatrical production. Focus will also be given to the field of event management.
Prerequisite: TDPS201, THET222, THET223, and THET116; and permission of ARHU-School of Theatre, Dance & Performance Studies department.

TDPS479 Production Practicum (1-3 Credits)
A graded course in a specified practical aspect of mounting a theatre or dance production. It is a hands-on, purely laboratory experience.
Prerequisite: TDPS201.
Repeatable to: 10 credits if content differs.
Credit Only Granted for: TDPS479 or THET479.
Formerly: THET479.

THET - Theatre

THET110 Introduction to the Theatre (3 Credits)
In the age of pop music and blockbuster films, of memes and viral videos, we often forget that theatre was one of the original forms of popular entertainment. We will focus on theatre practitioners including actors, directors, designers and backstage personnel to understand how theatre is produced. We will also consider popular entertainment in Europe and America, with a particular focus on musical theatre and Broadway to explore how theatre communicates, resonates, and remains relevant to all audiences.

THET116 Fundamentals of Theatrical Design (3 Credits)
Examines theatre as an environmental art that is realized through collaboration between set, costume, and lighting designers.
Restriction: Permission of ARHU-School of Theatre, Dance & Performance Studies department.

THET120 Introduction to Acting (3 Credits)
Through scene study, exercises, and improvisation, an appreciation is developed for the working habits of actors, which will aid them in rehearsal as well as performance.
Restriction: Must not be in Theatre program.

THET199 Independent Study (1-3 Credits)
An independent study in which each student completes an assigned major theatre project under close faculty supervision. Projects may culminate with term papers, scenic, lighting, or costume designs, or a stage production.
Restriction: Permission of instructor; and freshman standing.
Repeatable to: 6 credits if content differs.

THET222 Foundations of Acting and Performance (3 Credits)
Students will become familiar with the tools and process of acting through the discipline of acting exercises, analyzing character and performing. Students will research various theatre artists that have contributed to the acting process. Through monologue and scene work students will learn listening skills, communicative, collaborative and embodiment skills and will learn how to use the self in the imaginative process and research. And, most importantly, students will learn creative process through practice.
Restriction: Permission of ARHU-School of Theatre, Dance & Performance Studies department.

THET223 Text and Context in Western Theatre (3 Credits)
Introduction to the analysis and critique of the play script. Students will have the opportunity to read, analyze, and interpret western dramatic literature from a range of periods and styles. Texts are analyzed from a variety of theatrical analytical perspectives, with an eye towards choices theatre artists must make in the creation of a theatrical production.
Restriction: Permission of ARHU-School of Theatre, Dance & Performance Studies department.

THET228 Special Topics in Introductory Theatre and Performance (1-3 Credits)
This course is offered as part of the TDPS Artist-in-Residence program. Topics covered may include: Intercultural Theatre; Performance Art; Puppetry; Solo Performance; or Theatrical Design.
Prerequisite: TDPS201, THET116, THET222, and THET223; and permission of ARHU-School of Theatre, Dance & Performance Studies department.
Repeatable to: 3 credits if content differs.

THET251 Broadway Mashup: Remixing America Through Musical Theater (3 Credits)
Interrogate musical theater's political history, investigating how this uniquely American genre uses narrative, song, and dance to weave critical differences across race, ethnicity, immigration status, religion, gender, sexuality, and ability into our national fabric.

THET269 Special Topics in Study Abroad II (1-6 Credits)
Special topics course taken as part of an approved study abroad program.
Repeatable to: 15 credits if content differs.

THET274 Introduction to Stage Management (3 Credits)
Familiarization with the techniques and skills required of a Stage Manager in a theatrical production, including organization, production meetings, rehearsals, tech and running a show. The outcome at the conclusion of the course is the ability to function as an Assistant Stage Manager in a supervised situation.
Prerequisite: TDPS201; and permission of ARHU-School of Theatre, Dance & Performance Studies department.

THET279 Theatre Workshop I (1 Credit)
Supervised participation in backstage staffing of University Theatre productions.
Restriction: Permission of ARHU-School of Theatre, Dance & Performance Studies department.
Repeatable to: 6 credits if content differs.

THET282 Stage Makeup (3 Credits)
Students learn to design and execute character makeup based on research and script analysis. Studying fundamental facial anatomy, the class learns to manipulate light and shadow with makeup to enhance and alter the shape of facial features. Once these techniques are mastered, the class moves on to more complex exercises, including Old Age, Facial Hair, Wounds and Fantasy.

THET284 Stage Costume Construction I (3 Credits)
Study and practical experience in garment construction and related costume crafts as used in theatre costume design. Flat pattern development, corset construction, theatrical sewing techniques and organization of the costume construction process.
Restriction: Permission of ARHU-School of Theatre, Dance & Performance Studies department.

THET285 The Art of Communication and Presentation (3 Credits)
An introduction to the fundamental practice and theory of public speaking and oral communication using theatrical techniques of both performance and the craft of storytelling.
Credit Only Granted for: COMM107, COMM200, INAG110, JOUR130, or THET285.

THET286 Experiential Learning I (1-3 Credits)
Introductory internship in theatre. Constructed to help students in their sophomore year gain practical experience in a supportive work environment in the theatre. Student must research and propose internship to a Faculty Advisor and Internship Venue.
Prerequisite: THET222, THET223, and THET116. And THET114; or TDPS201. And permission of ARHU-School of Theatre, Dance & Performance Studies department.

THET287 Subversive Cultures and Performance (3 Credits)
Every society has rebels - those who refuse to conform to the mainstream's rigid rules, aesthetics, and beliefs. From unruly skateboarders, punk rockers, bohemian poets, and radical theater performers, to national revolutionary movements and brick-throwing anarchists - such groups form niches that are defined by their exclusion from society. We will look at how their beliefs and actions fit into a particular historical context, and how their actions drive social change.
Credit Only Granted for: THET289I or THET287.
Formerly: THET289I.

THET290 History Plays: From Conquest to Contemporary American Theatre (3 Credits)
Investigates the braided relationship between American history, theatre, and race. In this course, students will destabilize their understandings of each of these three terms by exploring them from two vantage points: from the point of view of historic American plays, and from the vantage of contemporary American "history plays" -- plays that draw on America's past to rewrite its future. Using the lens of Omi & Winant's theory of racial projects, students will explore how theatrical performances of racial difference from 1600 to 1900 were instrumental in crafting American ideologies, identities, and the nation state itself. The class will then telegraph through history to consider each historical play in dialogue with a contemporary "history play." Theatre 290 intentionally pivots between the past and present, page and stage, the political arena and the public sphere in order to demonstrate how America, theatre, and race consistently make and remake one another. The class emphasizes intersectional theories of race, and considers race alongside categories of gender and (dis)ability.
Recommended: THET110 and THET223 .

THET293 Black Theatre and Performance I (3 Credits)
Thematic and historical survey of African-American drama from the late nineteenth century to the 1960s. Emphasis on sociopolitical context, thematic thrust, issues, styles, the aesthetic reflected in the work, impact on African-American and general theatre audiences.

THET294 Black Theatre and Performance II (3 Credits)
Thematic and historical survey of African-American drama from the 1960s to the present. Emphasis on sociopolitical context, thematic thrust, issues, styles, the aesthetic reflected in the work, impact on African-American and general theatre audiences.
Restriction: Sophomore standing or higher.

THET299 Independent Study (1-3 Credits)
An independent study in which each student completes an assigned major theatre project under close faculty supervision. Projects may culminate with term papers; scenic, lighting, or costume designs; or a stage production.
Restriction: Permission of instructor; and sophomore standing or higher.
Repeatable to: 6 credits if content differs.

THET310 Voice for the Actor I (3 Credits)
Freeing the natural voice. In-depth experience of connection of actor's voice to thought, impulse and emotion. Tools for releasing tension, increasing resonance and range, and refining articulation will be explored.
Prerequisite: THET116, THET222, THET223, and TDPS201; and must Interview; and permission of ARHU-School of Theatre, Dance & Performance Studies department.
Restriction: Sophomore standing or higher.

THET324 Character Development (3 Credits)
European-based physical approach to acting. Primary focus on character development, may include creating original characters and learning how to bring to life an already scripted character. Techniques to explore the soul and psychology of characters and their physical qualities, voice, rhythm and movement.
Prerequisite: Must have completed or be concurrently enrolled in THET310.
Restriction: Junior standing or higher; and permission of ARHU-School of Theatre, Dance & Performance Studies department.

THET325 Actor's Process I (3 Credits)
Focus on use of self in creating character. Tools employed include decision-making and use of imagery, personalization, objectives, adjectives, and verbs.
Prerequisite: Must have completed or be concurrently enrolled in THET310; or permission of Instructor. And must audition; and permission of ARHU-School of Theatre, Dance & Performance Studies department.

THET326 Viewpoints (3 Credits)
Viewpoints is a movement-based performance course for students who already have a foundation in the basics of acting and/or dance. The Viewpoints are a set of tools and vocabulary; using 9 categories of time and space, students will fully explore the possibilities of using their physical instruments (the body) to their fullest on stage.
Prerequisite: THET222, THET223, THET116, and TDPS201; and permission of ARHU-School of Theatre, Dance & Performance Studies department.
Credit Only Granted for: THET328V or THET326.
Formerly: THET328V.

THET327 Movement for the Actor (3 Credits)
A highly physical approach to acting, based in the vocabulary of Anne Bogart's Viewpoints methodology. Students will explore the possibilities of using their physical instrument (the body) to its fullest on stage, so that they can avoid the pitfalls of "neck up" acting, find comfort in their bodies on stage, and express psychological choices from head to toe. The Viewpoints give an actor agency to be an active contributing artist in the rehearsal room, allow a director to create powerful stage pictures, and help to build strong ensembles. Collaborative class projects will range from realism to the abstract, and will include scene work, monologues and original devised performances.
Prerequisite: THET222 or THET120; or permission of instructor.
Restriction: Permission of Department.
Credit Only Granted for: THET326, THET327, or THET328O .
Formerly: THET328O.

THET328 Special Topics in Intermediate Theatre and Performance (1-3 Credits)
Topics covered include: Intercultural Theatre, Performance Art, Puppetry, Solo Performance, or Theatrical Design.
Prerequisite: TDPS201, THET222, THET223, and THET116; and permission of ARHU-School of Theatre, Dance & Performance Studies department.
Restriction: Junior standing or higher.
Repeatable to: 3 credits if content differs.

THET328W Theatre and Dance in Iran and Afghanistan (3 Credits)
Students will learn about stories, plays, and movements in Iran and Afghanistan from past to present. Through watching performances, readings, and discussions, we explore the relationship between storytelling, body, space, and power in forming and performing identity and life experiences. Looking at case studies from traditional, popular, and western style dance and theater are an exciting part of the course. Note: This course requires no prior knowledge of Persian culture or dance and theatre studies on the part of the students.
Cross-listed with: PERS385, TDPS358A.
Repeatable to: 3 credits if content differs.
Credit Only Granted for: TDPS358A, THET328W, PERS398A, or PERS385.
Formerly: PERS398A.

THET330 Play Directing I (3 Credits)
A lecture-laboratory course dealing with the techniques of coordinating, designing and guiding the production of a script through to performance. Study and practice in stage composition, movement, pacing, script and character analysis, and rehearsal routines. Emphasis on methods of communicating a script to an audience.
Prerequisite: TDPS201, THET222, THET223, and THET116. And permission of ARHU-School of Theatre, Dance & Performance Studies department.
Restriction: Junior standing or higher.

THET340 Playwriting I (3 Credits)
Will introduce students to the art of playwriting through exploratory writing exercises, the reading of successful plays, the development of new short scripts, how to make theatrical choices, and how to use the six elements of storytelling.
Prerequisite: THET222, THET223, THET116, and TDPS201.
Restriction: Permission of ARHU-School of Theatre, Dance & Performance Studies department.
Credit Only Granted for: THET340 or THET399P.
Formerly: THET399P.

THET351 Musical Theatre I (3 Credits)
An introduction for students interested in developing their skills with musical theatre, specifically the work of the actor interpreting songs and text in musicals. With a primary focus on American Musical Theatre repertoire, students will prepare and present various solo, duet, and group numbers.
Credit Only Granted for: THET351 or THET328M.
Formerly: THET328M.

THET360 Voice Archetypes (3 Credits)
The student will learn how to apply archetypal characters and expand performance potentialities, increase vocal self knowledge, discover rhythms, pitch variations, and sounds that reflect inner states of being.
Prerequisite: THET310; and permission of ARHU-School of Theatre, Dance & Performance Studies department.

THET363 The Business of the Business (3 Credits)
An in depth study of the business of working in the theatre. Explores early career opportunities and entry-level positions in the entertainment industry. Analyzes publicity, management, union, casting, and agency practices; how they apply to you and your career in the non-profit and commercial theatre.
Prerequisite: THET116, THET222, THET223, and TDPS201; and permission of ARHU-School of Theatre, Dance & Performance Studies department.

THET369 Special Topics in Study Abroad III (1-6 Credits)
Special topics course taken as part of an approved study abroad program.
Repeatable to: 15 credits if content differs.

THET371 Scenic Design I (3 Credits)
A study of design theory and style. Methods and techniques of coordination of all elements of scenic design for theatre.
Prerequisite: TDPS201, THET222, THET223, and THET116.

THET372 Stage Property Design (3 Credits)
Materials and techniques for the design and execution of stage properties with special emphasis on period research, special materials, and special effects.
Prerequisite: TDPS201; or permission of ARHU-School of Theatre, Dance & Performance Studies department.

THET373 Rendering for the Theatre I (3 Credits)
A study in the techniques and tools of drawing and painting. It is designed for the student to develop rendering and drawing skills for theatrical design presentation.
Restriction: Permission of ARHU-School of Theatre, Dance & Performance Studies department.

THET377 Lighting Design for Performance (3 Credits)
A study of the theories of electrification, instruments, design, color, and control for the stage. Practical work on productions.
Prerequisite: THET222, THET223, THET116, and TDPS201; or permission of ARHU-School of Theatre, Dance & Performance Studies department.

THET380 Sound Design (3 Credits)
Theatre Sound Design is a first course in designing sound for stage productions.
Prerequisite: THET116 and TDPS201; or permission of ARHU-School of Theatre, Dance & Performance Studies department.
Restriction: Sophomore standing or higher.

THET383 Costume Design I (3 Credits)
Basic principles of theatre costume design and introduction to rendering skills. Emphasis on development of design conception, unity, character statement, basic clothing design and period style adaptation.
Prerequisite: TDPS201, THET116, THET222, and THET223.

THET384 Stage Costume Construction II (3 Credits)
Study and practical experience in the construction of stage costumes, props and accessories. Pattern development by draping, millinery, and crafts.
Prerequisite: THET284; or permission of ARHU-School of Theatre, Dance & Performance Studies department.
Credit Only Granted for: THET384 or THET487.
Formerly: THET487.

THET385 Media Design (3 Credits)
Focuses on learning the grammar and conceptual thinking behind multimedia design for live performance. Students will learn how our new multimedia tools can enhance the sense of liveness as well as explore the different ways in which technology can be implemented into preproduction thinking, rehearsal experimenting, and ultimately, effective use in performance.
Prerequisite: THET222, THET223, THET116, and TDPS201; and permission of ARHU-School of Theatre, Dance & Performance Studies department.
Credit Only Granted for: THET399D or THET385.
Formerly: THET399D.

THET386 Experiential Learning (3-6 Credits)
Restriction: Junior standing or higher; and permission of ARHU-School of Theatre, Dance & Performance Studies department.

THET388 Special Topics in Performance Studies (3 Credits)
Performance Studies is a broad discipline that offers strategies for exploring diverse texts from diverse perspectives. Students are encouraged to explore critical and practical approaches to research and performance, including the History and Practice of Festivals and Carnival Performances, Comedy, Performance in Everyday Life, Contemporary Theatre at the Margins, and Stage Adaptation.
Prerequisite: THET222, THET223, THET116, and TDPS201; and permission of ARHU-School of Theatre, Dance & Performance Studies department.
Restriction: Sophomore standing or higher.
Repeatable to: 6 credits if content differs.

THET390 History of Theatre I (3 Credits)
The history of Western theatre from its origins in classical antiquity through the mid-seventeenth century with emphasis on plays and playwrights, architecture and decor, acting and costuming, and significant personalities. Includes explorations of interrelationships between Western theatre and the theatre of other cultures.
Prerequisite: Permission of ARHU-School of Theatre, Dance & Performance Studies department.

THET391 Theatre History II (3 Credits)
The history of Western theatre from the mid seventeenth century to the early twentieth century, with emphasis on plays and playwrights, architecture and decor, acting and costuming, and significant personalities. Includes explorations of interrelationships between Western theatre and the theatre of other cultures.
Prerequisite: Permission of ARHU-School of Theatre, Dance & Performance Studies department.

THET399 Independent Study (1-3 Credits)
An independent study in which each student completes an assigned major theatre project under close faculty supervision. Projects may culminate in term papers, scenic; lighting, or costume designs; or a stage production.
Restriction: Permission of instructor; and junior standing or higher.
Repeatable to: 6 credits if content differs.

THET408 Seminar: Theory and Performance Studies (3 Credits)
Studies in theatre theory and performance studies from classical antiquity to the present.
Repeatable to: 12 credits if content differs.

THET411 Voice for the Actor II (3 Credits)
Learn the International Phonetic Alphabet (IPA) and apply to exploration of sound and language. Designed to increase voice and speech awareness, and create a base knowledge from which to approach any accent or dialect.
Prerequisite: THET324 or THET325; and must audition; and permission of ARHU-School of Theatre, Dance & Performance Studies department.
Restriction: Junior standing or higher.

THET420 Language and the Actor (3 Credits)
Explores the actor's relationship to language, particularly heightened poetic language, in order to: develop the ability to embody language and vocally and physically project the images; apply an intellectual understanding of the inherent structural, poetic, and rhetorical techniques of heightened language in combination with action theory; and access the inner states of character while expressing them through text.
Prerequisite: THET325 or THET324; and must audition; and permission of ARHU-School of Theatre, Dance & Performance Studies department.

THET424 Movement II: Advanced Studies in Movement and Mask Theatre (3 Credits)
A deeper exploration of how to use the actor's instrument for dramatic expression. Continuing work in the F.M. Alexander Technique and foundational exercise to help actors learn what they need to prepare for rehearsal and performance. Other techniques may include theatrical styles, physical character, dramatic use and play with space and rhythm and masks.
Prerequisite: THET325 or THET324; and must audition; and permission of ARHU-School of Theatre, Dance & Performance Studies department.
Restriction: Junior standing or higher.

THET425 Actor's Process II (3 Credits)
A deeper exploration of the work begun in THET325. A continuation of creating a personal process through which the actor can confidently approach any genre of play. Special focus on status and subtext and the world of the playwright.
Prerequisite: THET325; and must audition; and permission of ARHU-School of Theatre, Dance & Performance Studies department.

THET426 Theatrical Clown (3 Credits)
Progression of developing individual clown characters through methods based on European pedagogy which emphasizes a physical and technical approach to actor training.
Prerequisite: THET324 or THET325; and must Audition.
Restriction: Permission of ARHU-School of Theatre, Dance & Performance Studies department.

THET428 Special Topics in Advanced Theatre and Performance (1-3 Credits)
This course is offered as part of the School of Theatre, Dance, and Performance Studies' Artist in Residence program. Topics covered may include: Intercultural Theatre; Performance Art; Puppetry; Solo Performance; or Theatrical Design.
Prerequisite: TDPS201, THET116, THET222, and THET223; and permission of ARHU-School of Theatre, Dance & Performance Studies department.
Restriction: Junior standing or higher.
Repeatable to: 3 credits if content differs.
Additional Information: Incorporate the change from THET 114 to TDPS 201, listing both numbers, as students will take the prerequisite under either number. To change the catalog description to reflect the proper unit name as the School of Theatre, Dance, and Performance Studies.

THET429 Actor's Studio (1-3 Credits)
Participation in dramatic roles executed under faculty supervision in the department's productions. Eligible students must make commitments and plan performances with course instructor during pre-registration.
Restriction: Permission of ARHU-School of Theatre, Dance & Performance Studies department.
Repeatable to: 10 credits.

THET435 Advanced Costume Construction (3 Credits)
The course is taught in a presentation/practical application format. Students will learn advanced techniques in draping and pattern development and develop proficiency in communication of design and construction choices.
Prerequisite: THET284 and THET384; and portfolio review; and permission of ARHU-School of Theatre, Dance & Performance Studies department.
Jointly offered with: THET635.
Credit Only Granted for: THET435 or THET635.

THET440 Advanced Playwriting (3 Credits)
Ensemble-based writer's workshop. It is the second part of a two-course sequence and is designed for students who already have a foundation in the basics of playwriting or who are other wise well-versed in the art of theatre and dramatic structure. Through exploratory writing sequences, the reading of full-length plays, and in-class readings of work-in-progress, students will continue to deepen their craft and develop the script for a new full-length play.
Prerequisite: THET240 or THET340; or permission of instructor. And permission of ARHU-School of Theatre, Dance & Performance Studies department.
Restriction: Permission of ARHU-School of Theatre, Dance & Performance Studies department.
Credit Only Granted for: THET440 or THET499P.
Formerly: THET499P.

THET447 Technologies of Japanese Performance (3 Credits)
Explores technologies of performance in Japan across the centuries. We will focus on concepts of likeness and liveness as they manifest in performance's mythical origins, the traditions of noh drama, the popular, commercial theatres of kabuki, bunraku, and Takarazuka, and contemporary experiments with robotics, Vocaloids, and other new technologies. Taught in English.
Cross-listed with: JAPN447.
Credit Only Granted for: THET447 or JAPN447.

THET451 Musical Theatre Workshop I (3 Credits)
Development of the ability to move, act and express through the media of lyric and music.
Prerequisite: Must audition.
Restriction: Permission of ARHU-School of Theatre, Dance & Performance Studies department.

THET452 Musical Theatre Workshop II (3 Credits)
Development of the ability to move, act and express through the media of lyric and music from the integrated musicals of the 1960s through the development of concert and rock/pop musicals.
Prerequisite: Must audition.
Restriction: Permission of ARHU-School of Theatre, Dance & Performance Studies department.

THET465 History of Fashion for the Theatre (3 Credits)
A survey of Western clothing from the Ancient Worlds through 20th Century. A discussion of the cultural contexts of various trends in fashion through an examination of art, industry and textiles.
Prerequisite: THET116; or permission of instructor.
Restriction: Sophomore standing or higher.

THET469 Study Abroad Special Topics IV (1-6 Credits)
Special topics course taken as part of an approved study abroad program.
Repeatable to: 15 credits if content differs.

THET471 Design Studio in Scenery (3 Credits)
Advanced study of scenic design for the theatre. Particular design projects will vary.
Prerequisite: THET371; and permission of ARHU-School of Theatre, Dance & Performance Studies department. Jointly offered with THET639.
Credit Only Granted for: THET471 or THET639.

THET472 Scene Painting (3 Credits)
Scene painting techniques and materials. Three-dimensional realistic scenery and non-realistic two-dimensional projects.
Prerequisite: TDPS201; or permission of ARHU-School of Theatre, Dance & Performance Studies department.

THET473 Rendering for the Theatre II (3 Credits)
Continued study in rendering techniques and graphic skills for theatrical design presentation. Emphasis on style, technique and use of different artistic media.
Prerequisite: THET373; or permission of instructor.

THET474 Advanced Stage Management (3 Credits)
Intensive practical study of the techniques and procedures for stage management.
Prerequisite: THET274; and permission of ARHU-School of Theatre, Dance & Performance Studies department.
Restriction: Permission of ARHU-School of Theatre, Dance & Performance Studies department; and sophomore standing or higher.

THET475 History of Art, Architecture, and Decor for the Theatre (3 Credits)
Study of Western art, architecture, and decor and their practical application to theatrical production.
Prerequisite: TDPS201, THET116, THET222, and THET223; and permission of ARHU-School of Theatre, Dance & Performance Studies department.
Jointly offered with: THET670.
Credit Only Granted for: THET475 or THET670.

THET477 Design Studio in Lighting (3 Credits)
Designed for students who have successfully completed THET377 and wish to further develop their lighting design skills. Emphasis is on theoretical design of productions and realized light lab projects. Particular design projects will vary.
Prerequisite: THET377; and permission of ARHU-School of Theatre, Dance & Performance Studies department. Jointly offered with THET659.
Credit Only Granted for: THET477 or THET659.

THET480 Advanced Sound Design (3 Credits)
Students will dive deeper into the technical elements of sound design, developing a working understanding of both software editing tools as well as the primary components of a live sound system.
Prerequisite: THET380 and permission of the School of Theatre, Dance, and Performance Studies.

THET481 Theatre Graphics II: Computer Assisted Design (3 Credits)
Study and practical application of computer generated graphical design for use in theatrical production.
Prerequisite: THET114 or TDPS201; and THET116; and permission of ARHU-Theatre department.
Restriction: Sophomore standing or higher.

THET482 Scene Painting II (3 Credits)
Advanced study of theatrical scenic painting.
Prerequisite: THET472; or permission of instructor.
Restriction: Sophomore standing or higher.

THET488 Special Topics in Theatre History Before 1800 (3 Credits)
Topics in the history of world theatre and performance from the Greeks through 1800.
Repeatable to: 12 credits if content differs.

THET489 Special Topics in Theatre History from 1800 to Present (3 Credits)
Topics in the history of world theatre and performance from 1800 to present.
Repeatable to: 12 credits if content differs.

THET491 Theatrical Rendering Using Photoshop (3 Credits)
A studio course in rendering for the theatre. The course focuses primarily on traditional approaches to perspective drawing, space, texture, color and lighting rendering using Photoshop. Photoshop tools and techniques; preparing three-dimensional objects for accurate rendering; and techniques for Photoshop rendering and lighting of three-dimensional objects and architectural forms. This class primarily has an emphasis on rendering/uses for scenic design.
Prerequisite: THET471.
Credit Only Granted for: THET491 or THET428O.
Formerly: THET428O.

THET497 Non-Traditional Theatre (3 Credits)
Seminar exploring American and European experimental performance since 1960. Topics include experimental theatre, performance art, pornography and performance, gender and performance, and popular culture and performance. Topics are treated historically and theoretically. Student-produced performance projects are an important component of the seminar.

THET498 Seminar: Theatre History (3 Credits)
Studies in theatre history from classical antiquity to the present.
Prerequisite: THET488 or THET489.
Restriction: Senior standing; and permission of instructor.
Repeatable to: 6 credits if content differs. Jointly offered with THET698.
Credit Only Granted for: THET498 or THET6 98.

THET499 Independent Study (1-3 Credits)
An independent study course in which each student completes an assigned major theatre project under close faculty supervision. Projects may culminate with term papers, scenic or costume designs, or a stage production.
Restriction: Permission of ARHU-School of Theatre, Dance & Performance Studies department.
Repeatable to: 6 credits.

THEX - Theatre Education Abroad

THEX100 London/Culture/Performance (3 Credits)
Introduces students to aspects of London's cultural resources and history and explores London as a performance site. Examines current issues in cultural politics and engages with the vast cultural resources, history, and global connections of London through analysis of a range of texts, performances and events, and sites around London.
Additional Information: This course is offered as part of the Arts & Humanities-in-London study abroad program. Students must apply for this program through Education Abroad: More information at https://globalmaryland.umd.edu/offices/education-abroad/program/11854. Education Abroad processes registrations for this course on behalf of students.

THEX101 Theatre and Performance in North America (3 Credits)
Studies contemporary drama and live art from countries including the United States, Canada, and Mexico. Explores how forms of and approaches to performance spread across a region and the globe through seminar discussions, readings, film, and television. Analyzes various performance styles and traditions including Indigenous performance, intercultural theatre, and Latinx theatre.
Additional Information: This course is offered as part of the Arts & Humanities-in-London study abroad program. Students must apply for this program through Education Abroad: More information at https://globalmaryland.umd.edu/offices/education-abroad/program/11854. Education Abroad processes registrations for this course on behalf of students.

THEX102 London: Walking the City (3 Credits)
What is a city? This course asks students to consider the different ways that we might define a city and to explore different perspectives on London inflected by mobility, migration, class and gender. Through reading a range of literary and theoretical texts, as well as walking lectures, students will develop an understanding of the role of literature, performance and cultural institutions in producing and contesting urban experience.
Additional Information: This course is offered as part of the Arts & Humanities-in-London study abroad program. Students must apply for this program through Education Abroad: More information at https://globalmaryland.umd.edu/offices/education-abroad/program/11854. Education Abroad processes registrations for this course on behalf of students.

THEX200 Acting (3 Credits)
A workshop on the fundamental techniques of acting, the course stresses methodology, discipline and development. It covers: stimulation of the actor's imagination, analytical insight into script and characters, expressive skills of body and voice, sensitivity, revelation, and expression. Develops emotional range and personal style.
Additional Information: This course is offered as part of the Maryland-in-Rome study abroad program. Students must apply for this program through Education Abroad: More information at ter.ps/UMRome. Education Abroad processes registrations for this course on behalf of students.

THEX300 Race and Racism in Performance (3 Credits)
Explores how race is performed in theater, art, and popular culture. Examines questions about racism in performance casting and practices.
Additional Information: This course is offered as part of the Arts & Humanities-in-London study abroad program. Students must apply for this program through Education Abroad: More information at https://globalmaryland.umd.edu/offices/education-abroad/program/11854. Education Abroad processes registrations for this course on behalf of students.

THEX301 Voice, Gender, Performance (3 Credits)
How do people use their voices, and what does this reveal or conceal about their gendered identities? How do gendered voices intersect with other aspects of identity, such as region, class, nation and race? This course explores how gender is voices in a variety of different spaces by drawing on theoretical material from a range of disciplinary fields, including cultural philosophy, sociolinguistics, film studies, and psychology while equipping students to use the voice creatively through mixed learning methods and attendance at exhibitions and performances.
Additional Information: This course is offered as part of the Arts & Humanities-in-London study abroad program. Students must apply for this program through Education Abroad: More information at https://globalmaryland.umd.edu/offices/education-abroad/program/11854. Education Abroad processes registrations for this course on behalf of students.

THEX302 Show Business: Theatre and Capitalism (3 Credits)
Explores the relationship between theater and capitalism through the examination of key economic problems as they arise in the theater (e.g. "star" performers, box office, theater as entertainment, theater as a "creative industry," theater and real estate). Considers how performance offers a distinctive lens through which to think about broader movements (e.g. neoliberalism, globalization, urban development) that have become central to our everyday lives.
Additional Information: This course is offered as part of the Arts & Humanities-in-London study abroad program. Students must apply for this program through Education Abroad: More information at https://globalmaryland.umd.edu/offices/education-abroad/program/11854. Education Abroad processes registrations for this course on behalf of students.

THEX303 Live Art: Then and Now (3 Credits)
Explores the recent history of Live Art, from the 1970s to the present via the study of significant as well as overlooked artists through audiovisual documentation, oral histories/interviews, and artists' writings, as well as significant scholarship and criticism in the field. Students will analyze performances and gain perspective on key themes for the study of Live Art, including (but not limited to) sexuality, gender, race and ethnicity, the blurring of art and life, extremity, duration, protest, and social engagement.
Additional Information: This course is offered as part of the Arts & Humanities-in-London study abroad program. Students must apply for this program through Education Abroad: More information at https://globalmaryland.umd.edu/offices/education-abroad/program/11854. Education Abroad processes registrations for this course on behalf of students.

THEX304 Scriptwriting: Creativity and Technique (6 Credits)
Delves into the world of scriptwriting through production of an original script and analysis of filmed scripts. Explores the context around reading scripts as well as how to write a short original film script with coherent dialogue, exposition and structure.
Additional Information: This course is offered as part of the Arts & Humanities-in-London study abroad program. Students must apply for this program through Education Abroad: More information at https://globalmaryland.umd.edu/offices/education-abroad/program/11854. Education Abroad processes registrations for this course on behalf of students.

THEX305 The History of Emotions (3 Credits)
We live in an era of angry voters, weeping celebrities, and governments intent on measuring happiness. The course explores the histories of feelings, emotions and passions through the study of a wide range of examples and case studies, and examines many different historical types, including intellectual history, gender history, cultural history, social history, religious history, the history of art, and the histories of science and medicine.
Additional Information: This course is offered as part of the Arts & Humanities-in-London study abroad program. Students must apply for this program through Education Abroad: More information at https://globalmaryland.umd.edu/offices/education-abroad/program/11854. Education Abroad processes registrations for this course on behalf of students.

TLPL - Teaching and Learning, Policy and Leadership

TLPL101 Inquiry Approach to Teaching STEM (Step 1) (1 Credit)
Explore STEM teaching and learning and classroom complexity, and develop teaching skills through discussion-based, collaborative class sessions, and experiences in local schools. To explore/understand the fundamentals of inquiry teaching, students will observe, plan and teach student-centered lessons.
Additional Information: Students must allow for a three-hour window between 7:45 AM and 3:15 PM in their schedule for field experiences in a local school 3-4 times during the semester. A background check is required and will be facilitated by the Terrapin Teacher program coordinator.

TLPL102 Inquiry Teaching of STEM in Middle School (2 Credits)
Second course in the Terrapin Teachers teacher preparation sequence. Students gain field experience and continue exploring teaching as a career by conducting teacher observations, and planning and implementing lessons in local, high-need middle school classrooms. Students work closely with UM master teachers to build upon the inquiry-based teaching practices developed in TLPL 101. Students work with mathematics and science curricula while attending to state and district standards, in order to develop and enact lessons that are responsive to students' reasoning in math and science.
Prerequisite: Must have completed TLPL101.
Additional Information: Attendance at each class session will be vital to student success in the course. To complete the observations and lessons, students must allow a three hour block of time during the local middle school operational hours from 7:45 am to 3:15 pm. A background check is required.

TLPL155 Learning to Learn biology (4 Credits)
This course focuses on learning, understanding, and working with core ideas in biology to engage in scientific practice and applications. In the spirit of "integrated STEM learning", this course will focus on applications of biological principles particularly as they relate to design solutions for human needs and participation in socioscientific issues. A sub-thread of the course is attention to the content of the Middle School Science Praxis exam sections on "Scientific Inquiry, Methodology, Techniques and History" (a topic that runs through the course) and "Life Sciences" to prepare students in the MSMS major to excel on this section of the Praxis. A laboratory component of the course engages students in investigations using either tangible physical and biological models or computational models. These investigations align with the content structure of the main throughline of the course.
Cross-listed with: BSCI155.
Credit Only Granted for: BSCI155 or TLPL155.

TLPL188 Select Topics in Education (1-3 Credits)
Special and intensive treatment of current topics and issues in teaching, learning, policy, and leadership.
Restriction: Permission of EDUC-Teaching and Learning, Policy and Leadership department.
Repeatable to: 6 credits.

TLPL200 Exploring Teaching as a Career (3 Credits)
Weekly participation as a volunteer tutor in a local school or community program with children or adolescents. Regular campus meetings assist with developing teaching skills and insight.
Credit Only Granted for: EDCI210 or TLPL200.
Formerly: EDCI210.

TLPL202 Good Stories: Teaching Narratives for Peace and Justice (3 Credits)
Through the study and use of oral storytelling and digital technologies explore qualities and characteristics of what makes a good story and how stories can be used to advance peace and justice on both individual and social levels.
Credit Only Granted for: EDCI246 or TLPL202.
Formerly: EDCI246.

TLPL204 Latino and Black Schooling: A History (3 Credits)
The historical, cultural, political and socio-economic factors that shape the school experience and achievement (Kindergarten - college) of Latinos and Blacks in the U.S.
Credit Only Granted for: EDCI286 or TLPL204.
Formerly: EDCI286.

TLPL206 Forbidden Books: Censorship of Children's and Young Adult Literature (3 Credits)
What is the relationship between censorship and intellectual freedom? This course examines the history of censorship from Plato to Fake News with a focus on contemporary censorship analyzed through historical, political, ethical, moral, philosophical, and socio-cultural perspectives. We consider the evolving definition of censorship, forms of censorship, the rationalizations and arguments for censorship, and the consequences and unintended results of censorship.
Credit Only Granted for: TLPL288W or TLPL206.
Formerly: TLPL288W.

TLPL210 Childhood Reimagined: Learning In and Out of Schools (3 Credits)
Surveys innovative approaches to child education, including unschooling, homeschooling, blended instruction, place-based learning, Big Picture Learning, democratic schools, microschools, self-directed learning centers, and other alternatives to traditional schools.
Credit Only Granted for: TLPL288K or TLPL210.
Formerly: TLPL288K.

TLPL250 Historical and Philosophical Perspectives on Education (3 Credits)
An examination of illustrative historical and philosophical examples of the interplay of ideas and events in the shaping of educational aims and practices from ancient cultures to modern technological societies.
Credit Only Granted for: EDPS210 or TLPL250.
Formerly: EDPS210.

TLPL251 Community, Learners, and Classroom Climate (3 Credits)
Focuses on classroom community building as an ethic of caring for students and examines the connection between classroom climate and learning. Topics include students' funds of knowledge, social-emotional competency, and the practices that maintain a safe and inclusive classroom climate. Wellness strategies to support teacher resilience are also addressed.
Additional Information: This course has a field component in a local elementary school.

TLPL252 Students, Schooling, and Communities (3 Credits)
Facilitates pre-service teachers' initial look at their personal backgrounds and the ways in which they view the world. Exploration of schools, students and their connections to communities. Draws on preservice teachers' concurrent field experiences.
Corequisite: TLPL251.
Credit Only Granted for: EDCI297 or TLPL252.
Formerly: EDCI297.

TLPL253 Language Rights and Repression in Education (3 Credits)
Many English-speaking Americans view societal monolingualism and English-speaking in schools as the standard. The proposed course will delve deeply into issues associated with language, language rights, education, and linguistic repression in schooling. The Big Question of our time this course asks is: Are access to education and native language maintenance civil rights? Human rights?

TLPL254 Surmounting School: Democracy, Inequality, and Schooling (3 Credits)
This Big Questions course explores the grandest challenges faced by today's public schools and asks: How do schools shape democracy and inequality in the U.S.? At the conclusion of this course, students will propose practical educational policy recommendations aimed at addressing its big question.

TLPL255 Watch your Language! Decoding the World Around Us (3 Credits)
This Big Questions course addresses the question: What is a "linguistic landscape"? How do we decode and interpret language on signs--buildings, roadways, flyers, storefronts, even t-shirts and what does it mean for our public spaces? How and why are languages displayed, hierarchized and used in social and school settings?

TLPL267 Education in Beta: Navigating an AI & Tech-Powered Future (3 Credits)
How should education evolve in a rapidly advancing AI and tech-driven world to ensure a just and human future? This interdisciplinary course examines how AI and emerging technologies are reshaping teaching and learning, inviting students to imagine equitable futures for education.

TLPL285 Decolonizing Climate Change Education: Fostering Inclusivity, Equity, and Holistic Understandings (3 Credits)
How climate science is measured, understood, communicated, and taught through Eurocentric and Indigenous lenses to situate climate change education at the nexus of socio-cultural and environmental justice. This course welcomes participants with varying levels of experience and expertise in the subject matter, ensuring an inclusive learning environment suitable for beginners and those with a more advanced understanding of the concepts involved. The curriculum is structured to accommodate a broad range of backgrounds, providing a valuable educational experience for everyone, regardless of prior familiarity with the concepts.

TLPL287 Inquiry Into Issues in US Public Schooling: Policies, Practice and Promise (3 Credits)
Students will inquire into enduring issues faced by US public education, focusing on the forces and stakeholders that have shaped current policy and practice. In addition, students will work to consider the real daily consequences of policy on the lives of students and teachers. Through crafting and researching a question of interest, employing a project based learning approach, students will take a deep dive into the most vexing issues faced by public education in the United States.
Credit Only Granted for: TLPL288T or TLPL287.
Formerly: TLPL288T.

TLPL288 Special Problems in Education (1-6 Credits)
Special and intensive treatment of current topics and issues in teaching, learning, policy and leadership. Available only to freshmen and sophomore students who have definite plans for individual study of approved problems relative to their preparation for teaching.
Restriction: Permission of EDUC-Teaching and Learning, Policy and Leadership department.
Formerly: EDPS288.

TLPL298 Special Problems in Education (1-6 Credits)
Exploration of current problems in teaching, learning, policy and leadership. Available only to students who have definite plans for study of approved problems.
Restriction: Permission of EDUC-Teaching and Learning, Policy and Leadership department.
Repeatable to: 6 credits if content differs.
Formerly: EDCI298.

TLPL300 Digital Learning Tools and Communities (1 Credit)
An exploration of the digital tools available for P12 students and their teachers that enhance learning and help build classroom community. This hybrid course will prepare P12 teachers to incorporate instructional technology, digital learning resources, and social media in P12 classrooms.
Restriction: Minimum cumulative GPA of 2.75; and must be in one of the following programs (Elementary Education; Secondary Educ: Social Studies; Secondary Educ: Art; Secondary Educ: Mathematics; Secondary Educ: Science; Secondary Educ: English Language Arts; Secondary Educ: Foreign Languages).
Credit Only Granted for: EDCI385 or TLPL300.
Formerly: EDCI385.

TLPL312 Curriculum and Instruction in Elementary Education: Mathematics (3 Credits)
Materials and procedures to help children sense arithmetical meanings and relationships. Development of an understanding of the number system and arithmetical processes. Includes laboratory/field experiences.
Prerequisite: TLPL361.
Corequisite: EDCI362, EDCI342, TLPL321, and TLPL362.
Restriction: Must be in Elementary Education program; and minimum cumulative GPA of 2.75; Or permission of EDUC-Teaching and Learning, Policy and Leadership department.
Credit Only Granted for: EDCI352 or TLPL312.
Formerly: EDCI352.

TLPL321 Curriculum and Instruction in Elementary Education: Science (3 Credits)
Objectives, methods, materials and activities for teaching science in the elementary school; emphasis on teaching strategies which help children learn the processes and concepts of science. Includes laboratory/field experiences.
Prerequisite: TLPL361.
Corequisite: TLPL312, EDCI362, EDCI342, and TLPL362.
Restriction: Must be in Elementary Education program; and minimum cumulative GPA of 2.75; Or permission of EDUC-Teaching and Learning, Policy and Leadership department.
Credit Only Granted for: EDCI372 or TLPL321.
Formerly: EDCI372.

TLPL332 Arts Integration in Elementary Classrooms (3 Credits)
An exploration of the theories and core practices associated with integrating the arts in ways that promote student learning in the core subjects.
Corequisite: TLPL362, EDCI362, TLPL361, and EDCI489.
Restriction: Must be in Elementary Education program; and minimum cumulative GPA of 2.75; Or permission of EDUC-Teaching and Learning, Policy and Leadership department.
Credit Only Granted for: TLPL306 or TLPL332.
Formerly: TLPL306.

TLPL340 Introduction to Children's Literature and Critical Literacy (3 Credits)
Analysis of literary materials for children and youth. Timeless and ageless books, and outstanding examples of contemporary publishing. Evaluation of the contributions of individual authors, illustrators and children's book awards.
Restriction: Must be in Elementary Education program; or must be a Pre-Education Major.
Credit Only Granted for: EDCI443 or TLPL340.
Formerly: EDCI443.

TLPL341 Assessing Language and Literacy Development in Elementary Classrooms (3 Credits)
An exploration of the social and cognitive processes involved in reading and writing, the developmental nature of those processes, the foundational concepts associated with effective literacy assessment, a variety of formative and summative literacy assessments, and the nature of individual differences in reading and writing.
Corequisite: TLPL479, EDHD411, and EDSP401.
Restriction: Must be in the Elementary Education program; and permission of EDUC-Teaching and Learning, Policy and Leadership.
Credit Only Granted for: TLPL341 or TLPL488R.
Formerly: TLPL488R.

TLPL342 Promoting Skilled and Motivated Readers in Diverse Elementary Classrooms (Part 1) (3 Credits)
An investigation of the materials, curriculum, teaching and learning practices and assessment methods associated with promoting skilled and motivated readers in diverse elementary classrooms. Teacher candidates will learn to use assessments to design instruction in the core components of reading, in line with students' individual needs and the Maryland College and Career Ready Standards.
Corequisite: TLPL362, TLPL361, TLPL332, and TLPL479.
Restriction: Must be in the Elementary Education program; and permission of EDUC-Teaching and Learning, Policy and Leadership.
Credit Only Granted for: TLPL488L or TLPL342.
Formerly: TLPL488L.

TLPL343 Promoting Skilled and Motivated Readers in Diverse Elementary Classrooms (Part 2) (3 Credits)
Application of the materials, curriculum, teaching and learning practices and assessment methods associated with classroom reading programs designed to promote skilled and motivated readers in diverse elementary classrooms. Teacher candidates will learn to assess and scaffold students' self-regulated literacy learning in line with students' individual needs and Maryland College and Career Ready Standards.
Corequisite: TLPL312, TLPL321, TLPL446, and TLPL489.
Restriction: Must be in the Elementary Education program; and permission of EDUC-Teaching and Learning, Policy and Leadership.
Credit Only Granted for: TLPL343 or TLPL488F.
Formerly: TLPL488F.

TLPL344 Culturally Responsive Language and Literacy Instruction in Diverse Elementary Classrooms (3 Credits)
Application of the asset-based practices associated with culturally responsive language and literacy programs. Teacher candidates will learn to plan, guide and assess students' integrated language and literacy practices (reading, writing, speaking and listening), with emphasis on writing instruction, in line with students' individual needs and Maryland College and Career Ready Standards.
Corequisite: TLPL300, TLPL478, and TLPL489.
Restriction: Must be in the Elementary Education program; and permission of EDUC-Teaching and Learning, Policy and Leadership.
Credit Only Granted for: TLPL488I or TLPL 344.
Formerly: TLPL488I.

TLPL360 Foundations of Education (3 Credits)
Social context of education and conflicts over philosophies, values, an goals that are reflected in educational institutions in our pluralistic society. Helps teachers become reflective, critical thinkers about the social and philosophical issues they face and the choices they make.
Credit Only Granted for: EDPS301 or TLPL360.
Formerly: EDPS301.

TLPL361 Community, Learners, and Classroom Engagement (3 Credits)
Focuses on classroom community building as an ethic of caring for students and examines the connection between classroom engagement and learning. Topics include student agency, the context and design of learning experiences, and the practices that sustain students' engagement in learning. Wellness strategies to support teacher resilience are also addressed.
Corequisite: TLPL332, TLPL362, TLPL342, and TLPL479G.
Restriction: Must be in Elementary Education program; and minimum cumulative GPA of 2.75; Or permission of EDUC-Teaching and Learning, Policy and Leadership department.

TLPL362 Curriculum and Instruction in Elementary Education: Social Studies (3 Credits)
Curriculum, organization and methods of teaching, evaluation of materials, and utilization of environmental resources. Emphasis on multicultural education. Includes laboratory/field experiences.
Corequisite: EDCI362, TLPL361, EDCI489, and TLPL306.
Restriction: Must be in Elementary Education program; and minimum cumulative GPA of 2.75; Or permission of EDUC-Teaching and Learning, Policy and Leadership department.
Credit Only Granted for: EDCI322 or TLPL362.
Formerly: EDCI322.

TLPL379 Professional Engagement In and Beyond the Secondary/MS/K-12 Classroom (1 Credit)
Provides an early field experience (e.g., tutoring young children) in secondary school settings (e.g., middle school). Recommended for students exploring the possibility of or intending to minor in Education or major in Secondary/MS/K-12 education. Credit will not be granted for experience accrued prior to registration. This course is open to all students but best suited for those interested in a career in education. Students need to be prepared to participate in as many as 10 in-person tutoring sessions over the course of the semester. Transportation is provided.
Repeatable to: 3 credits.
Additional Information: Students need to be available for a half day once a week to engage in the field based tutoring experience.

TLPL401 Student-Centered Curriculum and Instruction (3 Credits)
A focus on using student-centered teaching and learning approaches in high school STEM classrooms. Students will develop and implement a multi-day series of lessons, building upon the foundations of inquiry-based practices developed in prior courses. Students will also consider the implications of cultural awareness on teaching practices broadly, as well as in the specific contexts of their fieldwork.
Prerequisite: Permission of instructor; and TLPL102; and must have completed or be concurrently enrolled in TLPL414.
Credit Only Granted for: TLPL488P or TLPL401.
Formerly: TLPL488P.
Additional Information: Field experience for this course will require students to be available for a 2-4 hour block of time at various points throughout the semester to complete observations and teach lessons between 8:00 a.m. and 3:30 p.m. A background check is required and will be facilitated through the Terrapin Teacher program coordinator.

TLPL403 Teaching and Learning High School Mathematics (3 Credits)
Methods of teaching and assessing the high school mathematics curriculum; aligning tasks and activities to curriculum standards; lesson planning; and selection and use of technology. The course also focuses on managing large group dynamics in the high school mathematics classroom.
Prerequisite: Must have 2 semesters of calculus; or permission of EDUC-Teaching and Learning, Policy and Leadership department.
Corequisite: EDCI355.
Restriction: Must be in Secondary Educ: Mathematics program; and minimum cumulative GPA of 2.75; Or permission of EDUC-Teaching and Learning, Policy and Leadership department.
Credit Only Granted for: EDCI455 or TLPL403.
Formerly: EDCI455.

TLPL406 Teaching and Learning Mathematics in the Elementary School, Part 1 (3 Credits)
Focuses on teaching and learning whole numbers. Special emphasis will be placed on developing equitable teaching practices that enable culturally and linguistically diverse students to develop knowledge and skills that promote mathematical proficiency. Mathematical concepts: Content knowledge: some aspects of early numeracy, whole numbers and the four arithmetic operations, some aspects of algebraic thinking.
Jointly offered with: TLPL607.
Credit Only Granted for: TLPL607 or TLPL406.

TLPL407 Teaching and Learning Mathematics in the Elementary School, Part 2 (3 Credits)
Focuses on teaching and learning rational numbers (fractions and decimals) and developing algebraic thinking. Special emphasis will be placed on developing equitable teaching practices that enable culturally and linguistically diverse students to develop knowledge and skills that promote mathematical proficiency. Mathematical concepts: Content knowledge: rational numbers (fractions and decimals) and the four arithmetic operations, algebraic thinking, some aspects of geometry and measurement.
Credit Only Granted for: TLPL488G or TLPL407.

TLPL413 Teaching and Learning Middle School Mathematics (3 Credits)
Methods of teaching and assessing the middle school mathematics curriculum. Understanding the conceptual difficulties students have in moving from whole numbers to rational numbers, additive thinking to multiplicative thinking, and arithmetic to algebra. Lesson planning and selection of technology and other materials are applied in the context of supervised tutoring of students having difficulty in middle school mathematics. Lab and field experience required. Supervised tutoring takes place on site at a local middle school therefore TLPL413 students will be expected to travel to a local middle school for 8-10 of the class meetings.
Restriction: Minimum cumulative GPA of 2.75; and permission of EDUC-Teaching and Learning, Policy and Leadership department.
Credit Only Granted for: EDCI457 or TLPL413.
Formerly: EDCI457.

TLPL414 Knowing and Learning in Mathematics and Science (3 Credits)
Special and intensive treatment of current topics and issues in mathematics and science teaching and learning, policy and leadership. The overall goal of the course is to orient future teachers to the discourses and theories that shape what we know about how students learn math and science.
Prerequisite: Must have completed or be concurrently enrolled in TLPL102.
Credit Only Granted for: TLPL488M or TLPL414.
Formerly: TLPL488M.

TLPL415 Perspectives in Science (3 Credits)
Overview of the history of science and philosophical perspectives on science, particularly as they apply to science teaching.
Prerequisite: Permission of instructor.
Credit Only Granted for: TLPL488W or TLPL415.
Formerly: TLPL488W.

TLPL418 Teaching Residency (3-9 Credits)
An extended teaching internship in an Elementary Professional Development School. School placements to be arranged.
Prerequisite: Must have completed or be concurrently enrolled in TLPL352, TLPL363, TLPL372, TLPL415.
Restriction: Restricted to Elementary Education majors with permission of the Department; 2.75 GPA required.
Repeatable to: 12 credits.
Credit Only Granted for: TLPL418 or EDCI481.

TLPL420 Knowledge, Reasoning, and Learning in Science (3 Credits)
For prospective science teachers. Investigations of the nature of knowledge, reasoning, and learning in middle and secondary science. Readings from cognitive science and science education research; studies of student thinking in interview and classroom observations; analyses of curricula. Includes laboratory and field experiences.
Restriction: Minimum cumulative GPA of 2.75; and permission of EDUC-Teaching and Learning, Policy and Leadership department.
Credit Only Granted for: TLPL420 or EDCI411.
Formerly: EDCI411.

TLPL421 Practices in Secondary School Science Teaching (2 Credits)
Analyses of student thinking, instructional interpretations, strategies, and techniques in the teaching internship.
Prerequisite: TLPL425.
Corequisite: EDCI471 and EDCI474.
Restriction: Permission of EDUC-Teaching and Learning, Policy and Leadership department; and must be in Secondary Educ: Science program. Or minimum cumulative GPA of 2.75.
Credit Only Granted for: TLPL421 or EDCI480.
Formerly: EDCI480.

TLPL423 Interdisciplinary Teaching in the Middle Grades I (3 Credits)
For prospective middle school teachers. Studying and planning interdisciplinary instructional practices in middle school. Utilizes context and experiences from students' field placements. Use of technology and incorporation of technology into instruction.
Prerequisite: TLPL413 and TLPL420; or permission of instructor.
Restriction: Minimum cumulative GPA of 2.75; and must be in the Middle School Teacher Education Program, major code 0804P.
Credit Only Granted for: EDCI413 or TLPL423.
Formerly: EDCI413.

TLPL424 Interdisciplinary Teaching in the Middle Grades II (3 Credits)
For prospective middle school teachers. Planning and implementing interdisciplinary instructional practices in middle school. Draws on the context of and experiences in the student teaching placement. Use of technology and incorporation of technology into instruction.
Prerequisite: TLPL423.
Corequisite: TLPL489.
Restriction: Minimum cumulative GPA of 2.75; and must be in the Middle School Teacher Education Program.
Credit Only Granted for: EDCI414 or TLPL424.
Formerly: EDCI414.

TLPL425 Learning and Teaching in Science (3 Credits)
Studies of student learning and instructional practices in science teaching.
Prerequisite: TLPL420; or permission of instructor.
Restriction: Must be in Secondary Educ: Science program.
Credit Only Granted for: EDCI470 or TLPL425.
Formerly: EDCI470.

TLPL433 Foundations of Art Education (3 Credits)
Introduction to the field of Art Education and the role of the visual arts in grades PreK-12 for today's diverse school populations. The fundamental, historical and philosophic components of art education with an emphasis on arts disciplines and curriculum. Includes a school-based practicum. For those considering art education as a major.
Restriction: Minimum cumulative GPA of 2.75.
Credit Only Granted for: EDCI403 or TLPL433.
Formerly: EDCI403.

TLPL435 Art Education Methods I (3 Credits)
Methods I provides future art teachers with a knowledge base of the theories and best practices of effective pedagogy for: teaching methods and strategies, diversity, motivational techniques, classroom management, assessment and evaluation methods, and accommodating all students including those with special needs.
Restriction: Minimum cumulative GPA of 2.75; and permission of EDUC-Teaching and Learning, Policy and Leadership department. And must be in Secondary Educ: Art program; or must be in Secondary Educ: Art pre-major program.
Credit Only Granted for: EDCI405 or TLPL435.
Formerly: EDCI405.

TLPL436 Studio Processes and Materials: 2D (3 Credits)
A discussion/studio format used to develop skills, materials, resources and education strategies for using technology and two-dimensional art in K-12 programs.
Prerequisite: ARTT210.
Restriction: Minimum cumulative GPA of 2.75; and permission of EDUC-Teaching and Learning, Policy and Leadership department; and junior standing or higher; and must not be in any of the following programs (Early Childhood Education; Elementary Education; Secondary Educ: Science; Secondary Educ: English Language Arts; Secondary Educ: Mathematics; Secondary Educ: Foreign Languages; Secondary Educ: Social Studies; Physical Education; Music Education; Special Education).
Credit Only Granted for: EDCI406 or TLPL436.
Formerly: EDCI406.

TLPL437 Studio Processes and Materials: 3D (3 Credits)
A lecture-studio course to develop skills, material resources, and educational strategies for three-dimensional projects in school settings.
Restriction: Must be in Secondary Educ: Art program; or must be a Pre-Art Education Major.
Credit Only Granted for: EDCI407 or EDCI437.
Formerly: EDCI407.

TLPL440 Foundations of Educating Multilingual Learners (3 Credits)
Investigates historical, theoretical, and public policy issues and current practice in the field of education as it relates to multilingual learners (also known as English Language Learners, English Learners) in K-12 and other settings.
Credit Only Granted for: EDCI432 or TLPL440.
Formerly: EDCI432.

TLPL441 Methods for Teaching Multilingual Learners (3 Credits)
Addresses best practices for supporting multilingual learners across academic contexts. It draws on current research regarding methods of teaching multilingual learners in PreK12 settings. Students analyze and apply classroom instruction.
Credit Only Granted for: EDCI434 or TLPL441.
Formerly: EDCI434.

TLPL442 Foundations of Literacy and Biliteracy Development (3 Credits)
An overview of the research on literacy and biliteracy development for English learners. Specifically, the course explores the theoretical models and processes of teaching reading and writing, current literacy/biliteracy issues, assessment, and strategies for developing literacy and biliteracy skills for English learners.
Credit Only Granted for: EDCI435 or TLPL442.
Formerly: EDCI435.

TLPL443 Cross-Cultural Communication and Multilingual Learners (3 Credits)
Participants will research and critically reflect upon aspects of culture as a basis to understand students and to develop principles to guide culturally inclusive teaching decisions. Participants will better understand the role of culture and language in schooling in order to create classrooms where culturally and linguistically diverse students (also known as English Language Learners, English Learners) can succeed.
Credit Only Granted for: EDCI436 or TLPL443.
Formerly: EDCI436.

TLPL444 Teaching and Understanding English Grammar with Multilingual Learners (3 Credits)
Students will analyze the major grammatical structures of American English and the role of teaching grammar and developing effective classroom methods and techniques for multilingual learners. To do so, students will be exposed to diverse theories, approaches, methods, and practical techniques of grammar instruction in order to assist multilingual learners (also known as English Language Learners, English Learners) K-12 classrooms.
Credit Only Granted for: EDCI437 or TLPL444.
Formerly: EDCI437.

TLPL445 Methods I: World Language Methods and Technology (3 Credits)
Explores Dual Language/World Language Methods and Second Language/Bilingual development. Implications for teaching and initial lesson design are explored through on-campus seminars as well as guided field experiences. Students should reserve a regular half-day per week for the field experience in local schools.
Restriction: Minimum cumulative GPA of 2.75; and permission of EDUC-Teaching and Learning, Policy and Leadership department.
Credit Only Granted for: TLPL445 or TLPL695.

TLPL446 Language Variation and Multilingualism in Elementary Classrooms (3 Credits)
Issues in language variation and multilingualism in elementary classrooms, schools and communities with a focus on classroom practice, assessment, and policy.
Restriction: Must be in Elementary Education program; and minimum cumulative GPA of 2.75. Or permission of EDUC-Teaching and Learning, Policy and Leadership department.

TLPL447 Art Education Methods II (3 Credits)
Methods II builds upon the pedagogical foundation of Methods I and provides future art teachers with the means for developing pre K-12 art lessons and unit plans for a balanced qualitative art program for today's diverse and inclusive schools and classrooms.
Prerequisite: TLPL435; or students who have taken courses with comparable content may contact the department.
Restriction: Minimum cumulative GPA of 2.75; and must be in Secondary Educ: Art program.
Credit Only Granted for: EDCI423, EDCI603, TLPL447 or TLPL633.
Formerly: EDCI423.

TLPL450 Advanced World Language Methods and Technology (3 Credits)
Teaches advanced best practices for effective world language instruction. Topics include: using authentic assessment and materials, applying national standards, teaching writing and culture, motivating students, providing strategy instruction, infusing technology, preparing for PreK-12 employment, and creating a professional portfolio.
Prerequisite: TLPL445.
Corequisite: EDCI438.
Restriction: Must be in Secondary Educ: Foreign Languages program; and minimum cumulative GPA of 2.75. Or permission of EDUC-Teaching and Learning, Policy and Leadership department.
Credit Only Granted for: EDCI433, EDCI688A, TLPL450 or TLPL696.
Formerly: EDCI433.

TLPL451 Teaching and Learning in Secondary Education: English (3 Credits)
An introduction for prospective middle and secondary English teachers into the basic issues, concepts, orientations, and processes that shape the teaching of English for diverse students in schools. Candidates explore their own perspectives in relation to local and national trends and develop basic teaching understanding and skills through on-campus seminars, teaching laboratory experiences, and guided field experiences. Students should reserve one full day or two half days per week for field experience.
Credit Only Granted for: EDCI416 or TLPL451.
Formerly: EDCI416.

TLPL452 Bases for English Language Instruction (3 Credits)
Examines current theory, research, best practice, curricula and materials focused on the teaching of English language to native and non-native English learners. Topics include morphology, syntax, semantics, vocabulary, pragmatics, argument, discourse structure, dialects, edited academic English, English language proficiency (listening, speaking, reading, writing) assessment, and instructional planning. English Language Learner (TESOL and SIOP) and special needs (inclusion) pupil issues considered.
Restriction: Must be in Secondary Educ: English Language Arts program; and minimum cumulative GPA of 2.75; and permission of EDUC-Teaching and Learning, Policy and Leadership department.
Credit Only Granted for: EDCI417 or TLPL452.
Formerly: EDCI417.

TLPL453 Life in Two Languages: Understanding Bilingual Communities and Individuals (3 Credits)
Overview of society and individual multilingualism. Topics include diglossia, language shift, codeswitching, bilingual first language acquisition, language attrition, dual language education policy and practice.

TLPL456 Teaching Writing (3 Credits)
Examines current theory, research, best practice, curricula and materials for teaching written communication in grades K-12. Focuses on analytical, argumentative, informative/explanatory, literary analysis, narrative, descriptive, and research writing. Emphasizes instructional planning, assessment, writer problem-solving strategies, information search, development, organization and style appropriate to task, purpose and audience for both non-digital and digital text. English Language Learner and special needs pupil issues considered.
Corequisite: EDCI447.
Restriction: Must be in Secondary Educ: English Language Arts program; and minimum cumulative GPA of 2.75. Or permission of EDUC-Teaching and Learning, Policy and Leadership department.
Credit Only Granted for: EDCI467 or TLPL456.
Formerly: EDCI467.

TLPL457 Literature for Adolescents (3 Credits)
Reading and analysis of fiction and nonfiction; methods for critically assessing quality and appeal; current theory and methods of instruction; research on response to literature; curriculum design and selection of books.
Restriction: Minimum cumulative GPA of 2.75; and permission of EDUC-Teaching and Learning, Policy and Leadership department.
Credit Only Granted for: EDCI466 or TLPL457.
Formerly: EDCI466.

TLPL460 Materials and Instruction for Creating Skilled and Motivated Readers, Part I (3 Credits)
Explains the educational research that addresses the acquisition of reading and its underlying processes, including research-based reading instruction and materials. Learn how to create a literacy learning environment that helps diverse learners become skilled and motivated readers through phonemic awareness, phonics, fluency, comprehension, vocabulary, and whole and small-group instructional approaches.
Restriction: Must be in Elementary Education program; and junior standing or higher. Or permission of EDUC-Teaching and Learning, Policy and Leadership department.
Credit Only Granted for: EDCI461 or TLPL460.
Formerly: EDCI461.

TLPL461 Materials and Instruction for Creating Skilled and Motivated Readers, Part II (3 Credits)
Selecting, evaluating, and using a variety of materials to create skilled and motivated readers in the elementary grades, particularly in diverse classroom settings; Topics include word analysis, spelling, writing, reading comprehension strategies, directed reading lessons, and explicit instruction.
Prerequisite: TLPL361 and TLPL460.
Corequisite: TLPL312, EDCI342, TLPL321, and TLPL362.
Restriction: Minimum cumulative GPA of 2.75; and permission of EDUC-Teaching and Learning, Policy and Leadership department; and must be in Elementary Education program.
Credit Only Granted for: EDCI462 or TLPL461.
Formerly: EDCI462.

TLPL462 Reading in the Secondary School (3 Credits)
Provides secondary school teachers with understanding the need for and approaches to teaching students to read and learn from content area texts.
Restriction: Minimum cumulative GPA of 2.75; and must be in one of the following programs (Middle School Education; Secondary Educ: Science; Secondary Educ: English Language Arts; Secondary Educ: Mathematics; Secondary Educ: Foreign Languages; Secondary Educ: Social Studies; Secondary Educ: Art) ; and permission of department required for post-baccalaureate students.
Credit Only Granted for: EDCI463 or TLPL462.
Formerly: EDCI463.

TLPL470 Knowledge, Reasoning, and Learning in Secondary Social Studies (3 Credits)
An exploration of the nature of knowledge and reasoning in social studies disciplines as well as how students learn social studies. Assessment and investigation of students' conceptions and misconceptions as well as their disciplinary thinking. Implications for teaching and initial lesson design are explored through on-campus seminars as well as guided field experiences. Students should reserve a regular half-day per week for the field experience in local schools. This course is required for admission to the secondary social studies double major.
Restriction: Permission of EDUC-Teaching and Learning, Policy and Leadership department; and minimum cumulative GPA of 2.75.
Credit Only Granted for: EDCI426 or TLPL470.
Formerly: EDCI426.

TLPL471 Curriculum, Teaching, and Assessment in Secondary Social Studies (3 Credits)
An exploration of curriculum development, teaching, and assessment in secondary history/social studies. Focus on identifying students' conceptions of social studies topics and designing lessons that advance students' disciplinary thinking and understanding.
Prerequisite: TLPL470.
Corequisite: EDCI428.
Restriction: Must be in Secondary Educ: Social Studies program; and minimum cumulative GPA of 2.75. Or permission of EDUC-Center for Learning & Educational Technology.
Credit Only Granted for: EDCI427 or TLPL471.
Formerly: EDCI427.

TLPL475 Equitable Classrooms (2 Credits)
An exploration and application of major theoretical frameworks surrounding equity and critical pedagogy. Creating habits of mind that help teachers see all students as capable of achieving at high levels. Draws on the concurrent field experience.
Prerequisite: TLPL252, TLPL413, and TLPL420.
Corequisite: EDCI360 and TLPL423.
Restriction: Minimum cumulative GPA of 2.75; and must be in Middle School Education program.
Credit Only Granted for: EDCI424 or TLPL475.
Formerly: EDCI424.

TLPL476 Equity and Pedagogy (2 Credits)
An exploration and application of major theoretical frameworks surrounding equity and critical pedagogy. Pedagogical decision making that leads to greater equity and improved student learning for all students. Draws on the concurrent student teaching experience.
Prerequisite: TLPL475.
Corequisite: TLPL424 and EDCI460.
Restriction: Minimum cumulative GPA of 2.75; and must be in one of the following programs (Middle School Education; Early Childhood Education; Elementary Education; Secondary Educ: Science; Secondary Educ: English Language Arts; Secondary Educ: Mathematics; Secondary Educ: Foreign Languages; Secondary Educ: Social Studies; Physical Education; Music Education; Secondary Educ: Art; Special Education).
Credit Only Granted for: EDCI425 or TLPL476.
Formerly: EDCI425.

TLPL477 Teaching Academically, Culturally, and Linguistically Diverse Students in Middle School and Secondary Education (2 Credits)
Instruction on methods of teaching academically, culturally, and linguistically diverse students in middle school and secondary classrooms.
Restriction: Must be in the teacher education program; or permission of EDUC-Teaching and Learning, Policy and Leadership department.
Credit Only Granted for: TLPL488B or TLPL477.
Formerly: TLPL488B.

TLPL478 Professional Seminar in Education (1-3 Credits)
Seminar on the issues and problems teacher candidates encounter in classrooms. Exploration of the skills and strategies that best address these challenges.
Restriction: Must be in a major within the EDUC-Teaching and Learning, Policy and Leadership department.
Repeatable to: 4 credits.
Formerly: EDCI488.

TLPL479 Field Experiences in Education (1-4 Credits)
Field experiences in approved eduation setting with appropriate supervision. Credit not to be granted for experience accrued prior to registration. Open only to students admitted to approved teacher education programs.
Restriction: Permission of EDUC-Teaching and Learning, Policy and Leadership department.
Repeatable to: 2 credits.
Formerly: EDCI489.

TLPL481 Embracing Diversity in the Classroom Community (3 Credits)
An exploration of the richness and complexity of student diversity that teacher candidates will encounter in PK12 classrooms. Students will engage in critical reflection around diversity and equity issues.
Restriction: Admission to teacher education program; or permission of EDUC-Teaching and Learning, Policy and Leadership department.

TLPL488 Special Topics in Education (1-3 Credits)
Special and intensive treatment of current topics and issues in teaching, learning, policy and leadership.
Restriction: Permission of EDUC-Teaching and Learning, Policy and Leadership department.
Credit Only Granted for: EDPS488 or TLPL488.
Formerly: EDPS488.

TLPL489 Internship in Education (1-12 Credits)
Internship or residency experiences in school settings with appropriate supervision. Credit not to be granted for experience accrued prior to registration. Open only to students admitted to approved teacher education programs.
Restriction: Permission of EDUC-Teaching and Learning, Policy and Leadership department.
Repeatable to: 12 credits.
Credit Only Granted for: EDPS489 or TLPL489.
Formerly: EDPS489.

TLPL498 Special Problems in Education (1-3 Credits)
Exploration of current problems in teaching, learning, policy and leadership. Available only to students who have definite plans for study of approved problems.
Restriction: Permission of EDUC-Teaching and Learning, Policy and Leadership department.
Credit Only Granted for: EDPS498 or TLPL498.
Formerly: EDPS498.

TLPL499 Workshops, Clinics, and Institutes (1-6 Credits)
The following type of educational enterprise may be scheduled under this course heading: Workshops conducted by the College of Education (or developed cooperatively with other colleges and universities) and not otherwise covered in the present course listing; clinical experiences in pupil-testing centers, reading clinics, speech therapy laboratories, and special education centers; institutes developed around specific topics or problems and intended for designated groups such as school superintendents, principals, and supervisors.
Credit Only Granted for: EDPS499 or TLPL499.
Formerly: EDPS499.

TLTC - Teaching and Learning Transformation Center

TLTC222 Academic Technologies (3 Credits)
Teaches students the instructional technology skills and strategies needed to support faculty teaching in technology-rich physical environments like the university's TERP classrooms as well as virtual environments such as ELMS-Canvas.
Restriction: Permission of TLTC required - enrollment restriction.
Credit Only Granted for: AGNR270, ARHU299T, BSOS288V, or TLTC222.

TLTC310 Leadership in Collaborative Learning Groups (3 Credits)
Experiential learning opportunity that applies principles of leadership, peer mentoring, and learning theory to the planning and facilitation of peer-led collaborative learning sessions. Incorporates research, reasoning, evidence, and feedback to develop a reflective practice.
Restriction: Restricted to students selected to participate in the Guided Study Sessions through the Teaching and Learning Transformation Center.
Credit Only Granted for: HESI318N or TLTC310.
Formerly: HESI318N.

TLTC333 Fundamentals of Academic Peer Mentoring (1 Credit)
How should scientific research influence the way we study and advance the academic performance of others? Learn about the scholarship of teaching and learning and develop the applied skills to support active learning as an academic peer mentor. Whether or not you ultimately pursue a career as an educator, the more effectively you can coach and support the performance of other people, and the more successful you will be. Guided online and face-to-face participation will culminate in a portfolio of your teaching activities and professional development.
Additional Information: This course is intended to be taken only once, in a student's first semester as an AMP.

TLTC399 Independent Study in Academic Peer Mentoring (1-3 Credits)
Earn academic credit for the time spent supporting a course in TLTC's Academic Peer Mentoring Program (AMP).
Prerequisite: Must have completed or be concurrently enrolled in TLTC333.
Restriction: Permission of TLTC required - enrollment restriction.
Repeatable to: 6 credits.

TLTC499 Independent Study in Teaching and Learning (1-3 Credits)
Earn academic credit for the time spent supporting TLTC's educational development programs and/or engaging in the scholarship of teaching and learning.
Restriction: Permission of TLTC required - enrollment restriction.
Repeatable to: 6 credits.

UMEI - Maryland English Institute

UMEI001 English as a Foreign Language: Beginning (12 Credits)
Intensive course for the non-native speaker of English who has little or no previous knowledge of English. Focus on the rapid acquisition of the basic features of English grammar and pronunciation and on speaking and understanding American English; reading and writing appropriate to the level will be included. Special fee required for this course. This course does not carry credit towards any degree at the University and does not count in the retention plan.
Restriction: Permission of EDUC-Dean-Maryland English Institute department.

UMEI002 English as a Foreign Language: Intermediate I (12 Credits)
Intensive course for the non-native speaker of English who has had some previous instruction in English. Emphasis on improving listening and speaking skills, on mastering intermediate grammatical structures, and on expanding vocabulary. Includes practice in reading and writing appropriate to the level. Special fee required for this course. This course does not carry credit towards any degree at the University and does not count in the retention plan.
Restriction: Permission of EDUC-Dean-Maryland English Institute department.

UMEI003 English as a Foreign Language: Intermediate II (12 Credits)
Intensive course for the non-native speaker of English who has mastered the essential structures of English grammar. Emphasis on improving communicative skills for a wide range of linguistic situations, on rapid expansion of vocabulary, and on improving reading comprehension and basic writing skills. Special fee required for this course. This course does not carry credit towards any degree at the University and does not count in the retention plan.
Restriction: Permission of EDUC-Dean-Maryland English Institute department.

UMEI004 English as a Foreign Language: Intermediate III (12 Credits)
Intensive course for the non-native speaker of English who has a good command of the basic features of spoken and written English. Emphasis on refining speaking and listening skills, on improving reading speed and comprehension of academic texts, and on developing writing skills for academic courses. Special fee required for this course. This course does not carry credit towards any degree at the University and does not count in the retention plan.
Restriction: Permission of EDUC-Dean-Maryland English Institute department.

UMEI005 Advanced English as a Foreign Language (6 Credits)
Semi-intensive course for the nearly proficient non-native speaker of English needing additional language instruction prior to undertaking full-time academic study. Speaking and listening skills; improvement of reading speed and comprehension; and development of writing skills. Special fee required for this course. This course does not carry credit towards any degree at the University and does not count in the retention plan.

UMEI011 Integrated English: Elementary (5-10 Credits)
English as a Second Language course for students at the elementary level.
Prerequisite: Placement exam; and permission of EDUC-Dean-Maryland English Institute department.

UMEI012 Integrated English: Intermediate (5-10 Credits)
English as a Second Language course for students at the intermediate level.
Prerequisite: Placement exam; and permission of EDUC-Dean-Maryland English Institute department.

UMEI013 Integrated English: Advanced (5-10 Credits)
English as a Second Language for students at the advanced level.
Prerequisite: Placement exam; and permission of EDUC-Dean-Maryland English Institute department.

UMEI028 Special Topics in English as a Second Language (1-2 Credits)
Focuses on particular English language topics for ESL student as indicated by title. Course intended to be taken concurrently with UMEI011, UMEI012, or UMEI013; but may be taken independently with special permission.
Repeatable to: 18 credits if content differs.

UNIV - University Courses

UNIV100 The Student in the University (1 Credit)
Introduces students to University life. In a small classroom setting, students will explore how to successfully bridge the gap between high school and college. Study skills, career decision-making, and student development processes will be explored.
Credit Only Granted for: EDCP108O or UNIV100.
Formerly: EDCP108O.

UNIV101 The Student in the University and Introduction to Computer Resources (2 Credits)
Introduces students to University life and current computer resources. In a small classroom setting, students will explore the world of higher education and current technological advances available to them. Additionally students will explore current resources both internal and external to the University, and how to utilize the World Wide Web as a research tool.

UNIV102 Confidence Building and Study Skills in Mathematics (2 Credits)
A mathematics preparatory class designed to facilitate a student's transition toward fundamental studies mathematics, including study skills and strategies for success.
Restriction: Must be in uTerp Individual Admits program.

UNIV104 Reading and Writing at the College Level (1 Credit)
A workshop designed to enhance students' college level reading and writing abilities to include study skills and strategies for success.
Restriction: Must be in uTerp Individual Admits program.

UNIV106 The Transfer Student in the University (1 Credit)
This course is designed to assist students in making a successful transition to the University of Maryland (UMD) and to serve as an extended orientation to campus living and learning.
Restriction: Must be a first-semester transfer student.
Credit Only Granted for: UNIV106 or EDCP108G.

UNIV107 Science Technology Engineering Mathematics Colloquium (1 Credit)
For students interested in pursuing a STEM related major. Introduces students to the fundamentals of career and major exploration and career development within the various disciplines of STEM.
Restriction: Must be a current student in Letters & Sciences.

UNIV108 Business Exploration Series Colloquium (1 Credit)
For students interested in pursuing a business career. Students learn the fundamentals of career development and what the internship/job search process entails.
Restriction: Must be a current student in Letters and Science.

UNIV110 Grand Challenges of Our Time (1 Credit)
An introduction to and solutions to society's grand challenges. Students meet with President Pines once a week and then in small discussion sections with two instructors. Previous topics have included literacy, Black Lives Matter, Covid, environmental justice, poverty, and voting and civic engagement.
Restriction: Must have Freshmen standing; and permission of instructor.

UNIV190 National Scholarships for International Goals (1 Credit)
Prepares first- and second-year students with international interests such as study abroad, language learning, and international careers to apply for nationally competitive scholarships, including how to write an effective personal statement. The course will help students focus and explore their interests, and connect these interests to current events. It will be of particular interest to students preparing for service-oriented and internationally focused careers.
Restriction: Freshman or Sophomore Standing.

UNIV218 Study Abroad Exploration (3 Credits)
Topics and assignments will vary by travel site.
Restriction: Must be in designated Study Abroad programs.
Repeatable to: 6 credits if content differs.

UNIV269 Connecting Across Cultures (1 Credit)
An examination of culture to guide study abroad students through the stages of cross cultural adjustment and to promote cultural competency by providing the motivation, knowledge and skills necessary to work with diverse individuals and teams.
Restriction: Must be in a study abroad program.

UNIV318 Special Topics in Study Abroad (3 Credits)
Topics and assignments will vary by travel site, as indicated by subtitles such as Italian Art, Chinese History, and French Theater.
Restriction: Must be in a designated Study Abroad program; and must not have six credits of CPSP379 if College Park Scholar student; and freshman standing or higher.

UNIV339 McNair Research Methods and Writing (2-6 Credits)
As an introduction to qualitative and quantitatvie research methods, students will be taught how to: (1) create, analyze, and disseminate knowledge conceptually and empirically; (2) write a research document; (3) use the IRB process; (4) develop research posters; (5) read and evaluate research studies; (6) read and understand statistics; (7) conduct interviews, develop surveys, and design experiments; and (8) communicate effectively to public audiences.
Restriction: Must have earned a minimum of 60 credits.

UNIV348 Federal Semester Seminar (3 Credits)
This topical seminar will approach Federal policy formation through a combination of framework-based and content-specific considerations. Content and themes will vary. The Federal Semester is an offering of the Office of Undergraduate Studies in conjunction with several academic colleges and the University Career Center.
Restriction: Must be in the Federal Semester program; and permission of UGST-Undergraduate Studies; and junior standing or higher.
Repeatable to: 6 credits if content differs.

UNIV349 Federal Semester Experiential Learning (1-6 Credits)
This is the internship component of the Federal Semester program, an offering of the Office of Undergraduate Studies in conjunction with several academic colleges and the University Career Center.
Prerequisite: UNIV348.
Restriction: Must be in the Federal Semester program; and must have a Learning proposal approved by the Office of Undergraduate Studies and student's internship sponsor; and junior standing or higher.
Repeatable to: 6 credits if content differs.

UNIV362 Designing Your Life after College (2 Credits)
Helps students anticipate and prepare for changes in finances, social life, health, and career dynamics they are likely to experience as they transition from college to working full-time. It focuses on understanding what resources students have as they enter the workforce as critical for navigating post-graduation changes successfully. It offers an overview of financial, risk management and professional development approaches to increase students' confidence regarding post-graduation decisions; in addition, it develops their creative problem solving and reflection skills to help them align the outcomes of their decisions with their values.
Restriction: Must have earned a minimum of 60 credits.

UNIV378 Beyond the Classroom Experiential Learning (1-3 Credits)
This is the internship component of the Beyond the Classroom program in which students hold internships at organizations such as governmental units and non-profit agencies.
Prerequisite: UNIV325.
Restriction: Must be in the Beyond the Classroom program; and must have proposal approved by director of Beyond the Classroom.

UNIV389 Special Topics in Undergraduate Studies (3 Credits)
Courses will focus on interdisciplinary topics and will be planned in cooperation with Undergraduate Studies.
Restriction: Freshman standing.
Repeatable to: 6 credits if content differs.

UNIV399 Experiential Learning in Undergraduate Studies (1-3 Credits)
Experiential learning offered in conjunction with certain designated Office of Undergraduate Studies programs.
Restriction: Must have a Learning proposal approved by the Office of Undergraduate Studies and student's internship sponsor; and junior standing or higher.
Repeatable to: 6 credits if content differs.

URSP - Urban Studies and Planning

URSP250 The Sustainable City: Exploring Opportunities and Challenges (3 Credits)
An exploration, through an interdisciplinary approach, of a number of issues related to making cities more sustainable in terms of environmental protection, economic opportunity, and social justice. The course assist students to develop skills in critical analysis and systems thinking and to use those skills in analyzing sustainability related problems and potential solutions, and to expand students' understanding of the political implications of crafting and moving towards a sustainable urban future.

URSP372 Diversity and the City (3 Credits)
Exploration of the different needs of diverse economic, racial/ethnic, and gender groups that live and work in cities, the historical background of differences, the impact of societal structures and group cultures, and how public and private policies do and can affect different groups.

URSP488 Selected Topics in Urban Studies and Planning (1-3 Credits)
Topics of special interest to advanced urban studies students.
Prerequisite: Permission of ARCH-Urban Studies & Planning Program program.
Repeatable to: 6 credits if content differs.

USLT - Latina/o Studies

USLT201 U.S. Latina/o Studies I: An Historical Overview to the 1960's (3 Credits)
Interdisciplinary course focusing on demographics, terminology and social constructs of race, class, ethnicity, indigeneity, gender, and sexuality associated with the historical and political roots of US Latinidades. Examines the formation, evolution an adaptation of US Latina/o communities as critical field of inquiry.

USLT202 US Latina/o Studies II: A Contemporary Overview 1960's to present (3 Credits)
Interdisciplinary course on emerging populations of Latinos in the 20th century with a focus on the multiple waves of latino immigration as a result of neocolonialism, imperialism, globalization and transnationalism. Examines the positioning of immigrant waves in the political, sociocultural and historical contexts of US Latinidades.

USLT269 Special Topics in Study Abroad II (1-6 Credits)
Special topics course taken as part of an approved study abroad program.
Repeatable to: 15 credits if content differs.

USLT320 Afro-Latinx Diasporas (3 Credits)
Examines the history of the African diaspora and the Afro-Latinx populations in the United States. Explores transnational migrations, comparative slave systems, labor, community formation, gender, sexuality, popular culture, and the changing meanings of blackness and latinidad.
Credit Only Granted for: USLT319A, USLT320, or AMST328E.
Formerly: USLT319A.

USLT369 Special Topics in Study Abroad III (1-6 Credits)
Special topics course taken as part of an approved study abroad program.
Repeatable to: 15 credits if content differs.

USLT401 Latinas/os and US Popular Culture (3 Credits)
An examination of the relationship between Latinas/os and popular culture in the United States. Using theoretical lenses drawn from cultural studies, visual culture studies, critical race theory, borderlands theory, and feminism, the course analyzes multiple texts from time frames past and present. Explores issues such as exclusion from and inclusion within US identity, transnational identifications and cultural flows, ethnoracial stereotyping and resistance to it, and intersections of Latina/o identity with aspects of class, race, sexuality, and gender. Investigates art, TV, music, cinema, and everyday lived experience.
Credit Only Granted for: USLT401, USLT498B, or AMST498M.
Formerly: USLT498B.

USLT403 Citizens, Refugees, and Immigrants (3 Credits)
Citizenship, Refugee and Immigrant are guiding categories that often define the Latina/o community in the United States. Employing this analytical lens, this course critically engages with notions of exclusion and inclusion, which included documentation, status, race, gender, and power. To better understand how these ideas and processes work, students are introduced to the history of Latina/o migration, US immigration policies, racial formation theory, gender construction, borderland theory, and the politics of territoriality.
Credit Only Granted for: USLT403, USLT498I, AMST498N, or IMMR419D.
Formerly: USLT498I.

USLT420 U.S. Latinas/os on the Silver Screen: The Silent Era to the Present Day. (3 Credits)
Combining media theory and film history, this course considers the film industry's relationship to Latinidad, examining issues such as the shift from silent film to sound, the impact made on Latina/o images by the Second World War, and Latinas/os in the Red Scare. The second half of the course turns its attention to self-representation by Latina/o filmmakers and empathetic images created by whites in and after the 1970s. Some of the questions that the course addresses include: How have Latinas/os been depicted in Hollywood history? How have inter-American foreign relations shaped the US Latina/o image? How have Latina/o filmmakers confronted issues such as racism and sexism in the United States?
Credit Only Granted for: USLT420, USLT498A or AMST498G.
Formerly: USLT498A.

USLT430 Globalization and the Diversifying U.S. (3 Credits)
While often talked about as a recent phenomenon and one focused on capital, the ebbs and flows of globalization has a long history among Latina/o communities in the United States. The impact and consequences of globalization can be seen in US foreign policy in Latin America. For instance, Operation Bootstrap in Puerto Rico and the Maquiladores on the Mexico and U.S. border. At the same time, it has shaped immigration policies and the social. political and cultural experiences of Latina/o workers in the U.S. Often blamed for "taking " jobs, this course takes a deeper look at the concrete reasons for the rise of globalism and its impact on Latina/o communities in the US.
Credit Only Granted for: USLT430, USLT498N, AMST498W, or IMMR419J.
Formerly: USLT498N.

USLT450 Central Americans and the United States: Culture, Politics, and Community (3 Credits)
With attention to history, memory, politics, and culture, this course examines the relationships, conflicts, and exchanges of people and power between the United States and the Central American isthmus. We will investigate the role of the US government and military, as well as US corporate interests and US-backed dictatorships, in the culture, politics, and economy of nations including El Salvador, Nicaragua, Guatemala, and Honduras. Through literature, feature films, documentary films, theatre, poetry, and other mediums, the class will analyze responses to this history in Central American cultural productions originating both from the isthmus and from Central Americans living in the United States. In addition to US interventions in the Americas, the course will examine migration from Central America to North America and will conclude by exploring the lives and activities of Central Americans living in the USA.
Credit Only Granted for: AMST498C, USLT450 or USLT498D.
Formerly: USLT498D.

USLT460 Revolutions and Diasporas (3 Credits)
How have revolutions in Latin America influenced the history of US immigration, refugee, and asylum policies? How have they changed US history, culture, experience, geography, politics and the future? This course examines both the history of major revolutions in Latin America and their impact on Latinx diasporic and immigrant communities in the US. It investigates questions of slavery and freedom US expansionism, radical politics, Third World liberation movements, and the politics of asylum and US immigration policies. Students in the course will learn transnationalist, diasporic, borderlands and other forms of Latinx historical methods. In addition, the course will focus on race, class, gender, sexuality, and the politics of location.
Credit Only Granted for: USLT460, USLT498R, or AMST498B .
Formerly: USLT498R.

USLT480 Race and Nation in U.S. Cinema (3 Credits)
From the 1915 release of D.W. Griffith's The Birth of a Nation to the present, cinema has been a crucial medium through which cultural producers have advanced and contested concepts of ethnoracial and national identity in the US. This course adopts a historically-grounded practice of media criticism to understand the ideology and iconography of both Hollywood's studio system and independent cinema. The course requires students to examine film and identity through multiple, racial, methodological and theoretical lenses, including film history, and film and media theory. Focus will be the cinematic politics and poetics of racial exclusion and inclusion, empathy and disidentification, power and resistance, and the shaping of a national "imagined community." We will pursue how ideas about class, sexuality, gender, and disability have informed ideologies concerning race and nation. Classes will be divided between lecture, film viewings, and, most importantly, class discussions.
Credit Only Granted for: AMST498P, USLT480, or USLT498C.
Formerly: USLT498C.

USLT488 US Latina/o Senior Seminar (3 Credits)
A variable topics seminar that exposes students to interdisciplinary critical readings, writings, and research in U.S. Latina/o Studies. Interdisciplinary research methodologies are broadly addressed. Students will gain skills and practice in reading critical analytic texts and will develop writing skills.
Recommended: USLT202 or USLT201.
Restriction: Senior standing; and permission of instructor.
Repeatable to: 9 credits if content differs.

USLT498 US Latina/o Studies: Special Topics (3 Credits)
Specific content to be announced when courses are offered.
Prerequisite: USLT202 or USLT201.
Restriction: Junior standing or higher.
Repeatable to: 9 credits if content differs.

VIPS - Vertically Integrated Projects

VIPS208 Starting with Vertically Integrated Projects (1-2 Credits)
Team members beginning their experience with VIP@Maryland will engage on interdisciplinary and vertically-integrated teams with a focus on research, design, industry competition, entrepreneurship, and community engagement projects related to active research and exploration areas of UMD faculty members. Students will also participate in lectures and professional development activities that include topics related to design, research, documentation and technical writing, communication, leadership and teamwork, ethics, project management, intellectual property, information literacy, and introduction to a broad range of applicable research topics, technologies and development tools. Students are expected to maintain involvement with the same project team for multiple terms.
Restriction: Permission of ENGR-Dean-Office of Global Engineering Leadership.
Repeatable to: 8 credits.
Additional Information: Students must apply through the VIP@Maryland application process in order to join a VIP team. For more information: go.umd.edu/vipmaryland.

VIPS308 Engaging with Vertically Integrated Projects (1-2 Credits)
Team members will expand their role and responsibilities on their selected VIP@Maryland team. They will engage on interdisciplinary and vertically-integrated teams with a focus on research, design, industry competition, entrepreneurship, and community engagement projects related to active research and exploration areas of UMD faculty members. Students will also participate in lectures and professional development activities that include topics related to design, research, documentation and technical writing, communication, leadership and teamwork, ethics, project management, intellectual property, information literacy, and introduction to a broad range of applicable research topics, technologies and development tools. Students are expected to maintain involvement with the same project team for multiple terms.
Restriction: Permission of ENGR-Dean-Office of Global Engineering Leadership.
Repeatable to: 8 credits.
Additional Information: Students must apply through the VIP@Maryland application process in order to join a VIP team. For more information visit: go.umd.edu/vipmaryland.

VIPS408 Leading with Vertically Integrated Projects (1-2 Credits)
Advanced team members will take on mentorship and leaderships roles within their VIP@Maryland project. They will engage on interdisciplinary and vertically-integrated teams with a focus on research, design, industry competition, entrepreneurship, and community engagement projects related to active research and exploration areas of UMD faculty members. Students will also participate in lectures and professional development activities that include topics related to design, research, documentation and technical writing, communication, leadership and teamwork, ethics, project management, intellectual property, information literacy, and introduction to a broad range of applicable research topics, technologies and development tools. Students are expected to maintain involvement with the same project team for multiple terms.
Restriction: Permission of ENGR-Dean-Office of Global Engineering Leadership.
Repeatable to: 12 credits.
Additional Information: Students must apply through the VIP@Maryland application process in order to join a VIP team. For more information: go.umd.edu/vipmaryland.

WEID - Words of Engagement Intergroup Dialogue Program

WEID139 Navigating Difference through Intergroup Dialogue (1 Credit)
The goal of intergroup dialogue is for students to develop comfort with, and skill for, discourse on controversial, difficult, and divisive topics in an effort to foster positive, meaningful, and sustained cross-group relationships. Whereas in debate, students learn to listen to gain advantage, in intergroup dialogue, students learn to listen to gain understanding. In so doing, students develop increased capacity for interaction across difference, heightened intergroup awareness and sensitivity, and greater commitment to community engagement.
Prerequisite: Completion of on-line enrollment form.
Cross-listed with: ENES338.
Repeatable to: 6 credits.
Credit Only Granted for: CHSE338, EDHI338, ENES338 or WEID139.
Formerly: CHSE338.

WGSS - Women, Gender, and Sexuality Studies

WGSS105 Introduction to Disability Studies (3 Credits)
Explores theories of disability justice as they intersect with feminist and antiracist struggles. Analyzing how disability has been an important aspect of institutions and social experience in the United States and beyond, the course considers how disability activists have responded to ableism by developing art, political strategies, and subcultures that promote a more just society built for a wider variety of human bodies.
Cross-listed with: AMST215.
Credit Only Granted for: WGSS105, AMST215, or AMST298D.
Formerly: AMST298D.

WGSS115 Gender, Race and Computing (3 Credits)
Race and gender have shaped computing from its earliest histories to contemporary debates over bias in search algorithms, surveillance, and AI. As computational processes shape ever more dimensions of everyday life from the personal to the global scale, understanding how they operate and how power operates within them grows ever more important. Combating racism and sexism is not as simple as ensuring the pool of programmers and engineers is more diverse; structures of power are embedded in digital technologies as they are in all aspects of our society, and we must learn to perceive their operation if we hope to transform them. We will examine how racism and sexism operate in the field of computer science and in everyday uses of digital technologies, while studying how feminist and racial justice movements have created alternative approaches. This class is for anyone who wishes to better understand the relationships between digital technology, structural power, and social justice.
Cross-listed with: CMSC115.
Restriction: Must not have taken CMSC216 or higher.
Credit Only Granted for: WGSS115 or CMSC115.

WGSS200 Introduction to WGSS: Gender, Power, and Society (3 Credits)
Examines constructions of race, class, sexuality, ability, and gender relations from a social science multi-disciplinary perspective. The course interrogates the ways that systems of hierarchy and privilege are created, enforced, and intersect through the language of race, class, sexuality, and national belonging. The course will provide students with the skills to examine how systems of power manifest in areas such as poverty, division of labor, health disparities, policing, violence. In addition to examining the impact of systems of power, students will reflect on their own location within the exercise of racialized, and gendered power relations. This course encourages students to understand and critique these systems both personally and politically.
Credit Only Granted for: WMST200 or WGSS200.
Formerly: WMST200.

WGSS205 Reproductive Justice: An Introduction (3 Credits)
Developed by feminists of color, reproductive justice frameworks offer a roadmap for economic, social, and medical justice advocacy attentive to the intersections of race, class, gender, sexuality, and disability. This course reviews the historical, legal, and social bases of reproductive rights in the U.S.; discusses the history of feminist organizing for reproductive freedom; surveys critical theories of reproductive justice that go beyond abortion law to advocate for broader social transformation; and evaluates the possible futures of intersectional feminist activism after the overturning of Roe v. Wade.

WGSS210 Love, Labor, and Citizenship: Women in America to 1880 (3 Credits)
An examination of the economic, family, and political roles of colonial slave, immigrant and frontier women in America from the pre-industrial colonial period through the early stages of 19th-century industrialization and urbanization.
Cross-listed with: HIST210.
Credit Only Granted for: HIST210, WMST210 or WGSS210.
Formerly: WMST210.

WGSS211 Women in America Since 1880 (3 Credits)
An examination of women's changing roles in working class and middle class families, the effects of industrialization on women's economic activities and status, and women's involvement in political and social struggles, including those for women's rights, birth control, and civil rights.
Cross-listed with: HIST211.
Credit Only Granted for: HIST211, WMST211 or WGSS211.
Formerly: WMST211.

WGSS212 Women in Western Europe 1750-Present (3 Credits)
An analysis of the economic, family, and political roles of European women from 1750 to the present. The effects of industrialization on women's work and status, the demographic parameters of women's lives, and women's participation in political events from market riots to suffrage struggles.
Cross-listed with: HIST212.
Credit Only Granted for: HIST212, WMST212 or WGSS212.
Formerly: WMST212.

WGSS230 Introduction to Humanities, Health, and Medicine (3 Credits)
An overview of the historical, cultural, ethical, and spiritual dimensions of medicine, human health, disease, and death from the points of view of various humanistic disciplines.
Cross-listed with: ARHU230, ENGL254, HIST219N.
Restriction: Permission of ARHU-History Department.
Credit Only Granted for: ARHU230 , ENGL289C, ENGL254, ARHU298A, HIST219N, or WGSS230.

WGSS250 Introduction to WGSS: Art and Culture (3 Credits)
Provides students with a critical introduction to the ways that art and art activism have served as a conduit to understanding and challenging systems of inequity and practices of normativity. Interrogating the categories of gender, sexuality, race, class, ability, the course will provide students with an examination of how artists have responded to pressing social justice issues of their eras. While the course centers visual art, students will also engage genres such as music, plays, literature, digital and performance art as arenas of social change.
Credit Only Granted for: WMST250 or WGSS250.
Formerly: WMST250.

WGSS255 Reading Women Writing (3 Credits)
Explores literary and cultural expressions by women and their receptions within a range of historical periods and genres. Topics such as what does a woman need in order to write, what role does gender play in the production, consumption, and interpretation of texts, and to what extent do women comprise a distinct literary subculture. Interpretation of texts will be guided by feminist and gender theory, ways of reading that have emerged as important to literary studies over the last four decades.
Cross-listed with: ENGL250.
Credit Only Granted for: ENGL250, WMST255 or WGSS255.
Formerly: WMST255.

WGSS263 Introduction to Black Women's Studies (3 Credits)
Interdisciplinary exploration of Black women, culture and society in the United States. Drawn primarily from the social sciences and history with complementary material from literature and the arts.
Cross-listed with: AAAS263.
Credit Only Granted for: WMST263, AASP298I, WGSS263, AAAS263 or AASP263.
Formerly: WMST263.

WGSS264 Quare/Queer Contentions: Exploration of Sexualities in the Black Community (3 Credits)
Centering the subjectivities of queer people of color generally and more specifically, Black people (as the word "quare" invites us to do), Quare/Queer Contentions takes up key moments within the history of the Black community and asks us to consider the work and presence of LGBTQ people in these moments. The course also contends with the everyday experiences of LGBTQ subjects in the Black community. Quare/Queer Contentions, therefore, interrogates the material realities of Black queer people in the context of family, religion, cultural/creative work, among others. Interdisciplinary in orientation, the course will employ primary and secondary texts, film, art, autobiographical narratives and policy data.
Cross-listed with: LGBT264, AAAS264.
Credit Only Granted for: LGBT264, AASP264, AAAS264, WMST264 or WGSS264.

WGSS265 Constructions of Manhood and Womanhood in the Black Community (3 Credits)
Investigates the ways that African Americans are represented and constructed in public and private spheres and explores the social constructions and representations of Black manhood and womanhood from various disciplinary perspectives.
Cross-listed with: AAAS265.
Credit Only Granted for: WMST265, AASP298B, AAAS265, WGSS265 or AASP265.
Formerly: WMST265.

WGSS267 Introduction to Black Women's Cultural Studies (3 Credits)
An introduction to black women's cultural production and to an understanding of how the social norms and ideals about women within black communities and in the larger society have shaped black women's own self-perceptions and behaviors and thus their cultural production.
Credit Only Granted for: WMST267 or WGSS267.
Formerly: WMST267.

WGSS269 Special Topics in Study Abroad II (1-6 Credits)
Special topics course taken as part of an approved study abroad program.
Repeatable to: 15 credits if content differs.
Formerly: WMST269.

WGSS271 Monsters and Racism: Black Horror and Speculative Fiction (3 Credits)
The previous decade has been considered a renaissance for Black Horror. From Get Out to Lovecraft Country, the genre has enjoyed unprecedented mainstream media buzz and accolades. This course looks at contemporary Black horror and speculative fiction as cultural texts which put into question our notions of human(e) and inhuman(e) through critiques of white supremacy and accompanying oppressions. Students will learn a host of critical skills through close reading and analysis of literature and film by Black creators such as Jordan Peele, Misha Green, Toni Morrison, Jewelle Gomez, and Octavia Butler. With the ability to interpret cultural texts using literary criticism, film analysis, history, cultural studies, ethnic studies, feminist theory, and the social sciences, students will connect these texts to continuing historical and contemporary issues of racial and cultural oppression such as medical discrimination, policing and criminalization, misogynoir, and racialized capitalism.
Cross-listed with: AAAS271, ENGL289J.
Credit Only Granted for: AAAS271, ENGL289J, HONR299Y, HNUH238W, WGSS271 or WGSS298W.
Formerly: HNUH238W.

WGSS275 World Literature by Women (3 Credits)
Comparative study of selected works by women writers of several countries, exploring points of intersection and divergence in women's literary representations.
Cross-listed with: CMLT275.
Credit Only Granted for: WMST275, CMLT275 or WGSS275.
Formerly: WMST275.

WGSS280 Gender and Science in Film and Media (3 Credits)
Isaac Azimov once said of science fiction that it is the genre that "deals with the reaction of human beings to changes in science and technology." With this definition in mind, we will embark on a critical exploration of sci-fi film and other media, using it as a lens for analyzing society's deepest fears and most furtive hopes. Our investigation will center on the liminal space between hegemonic culture and its prescribed excesses. These liminal spaces--between self and other, disability and enhancement, cultural hybridization, and gender crossing--shift in response to real-world sociopolitical tensions. We will consider feminist and anti-racist media scholars' concerns over representation, authorship and ideology alongside questions of technological change. Students will use analytical and creative assignments to explore not only how the scientific imaginary serves as fertile ground for feminist, disability, and anti-racist critique, but also provides a locus for alternative futures.
Cross-listed with: ENGL289I.
Credit Only Granted for: ENGL289I or WGSS280.

WGSS290 Bodies in Contention (3 Credits)
Explores the contributions of feminist scholarship in framing and resolving contemporary controversies concerning gendered bodies. It includes the ways in which knowledge about the human body has been shaped by cultural ideas of gender, race, sexuality and ability.
Credit Only Granted for: WMST298D or WGSS290.
Formerly: WMST298D.

WGSS291 Racialized Gender and Rebel Media (3 Credits)
An introduction to the interdisciplinary field of women's studies and an exploration of the ways in which media has been used as a platform for racial justice, feminist activism, and cultural transformation, with a principal focus on the expressions of women of color. The goals of the course are to explore how different forms of media shape the stories which circulate about race, femininities, masculinities, ethnicities, sexualities, religiosity, power and difference, and to examine how various media formats been used to disrupt dominant stories, to tell new stories, and to create differing understandings of citizenship.
Credit Only Granted for: WGSS291 or WMST298N.
Formerly: WMST298N.

WGSS298 Special Topics in Women, Gender, and Sexuality Studies (1-3 Credits)
Thematic exploration of a topic in women, gender, and sexuality studies.
Repeatable to: 6 credits if content differs.
Formerly: WMST298.

WGSS298L History of Sexuality in America (3 Credits)
Explores the social construction of sexualities from the first colonial settlement to the modern era in the United States. Analyzes the implications of these understandings for power relations in U.S history.
Cross-listed with: HIST213.
Credit Only Granted for: HIST213, WMST298L or WGSS298L.

WGSS298N The Politics of Sexuality in America: A Historical Approach (3 Credits)
Why do particular issues about sexuality hold such an important place in American political debates? What animates these controversies and what can a historical perspective on these issues add to our understanding of modern sexual politics? This class explores the historical sexual politics that undergird contemporary debates concerning sexuality in America. It focuses on topics that garner significant public attention - Reproductive rights - LGBTQ rights - Sexting - and explores the histories that undergird Americans disagreements.
Cross-listed with: HIST289N.
Credit Only Granted for: HIST289N or WGSS298N.

WGSS298W Monsters and Racism: Black Horror and Speculative Fiction (3 Credits)
The previous decade has been considered a renaissance for Black Horror. From Get Out to Lovecraft Country, the genre has enjoyed unprecedented mainstream media buzz and accolades. This course looks at contemporary Black horror and speculative fiction as cultural texts which put into question our notions of human(e) and inhuman(e) through critiques of white supremacy and accompanying oppressions. Students will learn a host of critical skills through close reading and analysis of literature and film by Black creators such as Jordan Peele, Misha Green, Toni Morrison, Jewelle Gomez, and Octavia Butler. With the ability to interpret cultural texts using literary criticism, film analysis, history, cultural studies, ethnic studies, feminist theory, and the social sciences, students will connect these texts to continuing historical and contemporary issues of racial and cultural oppression such as medical discrimination, policing and criminalization, misogynoir, and racialized capitalism.
Cross-listed with: HNUH238W.
Credit Only Granted for: HONR299Y, HNUH238W, or WGSS298W.
Formerly: HONR299Y.

WGSS301 Feminist Knowledge Production (3 Credits)
An introductory research skill-building course rooted in the ethical and political questions we ask when we work in communities struggling for a more just future. We will consider the fundamentals of scholarly research -- library skills, conceptualizing a research question, evaluating sources, understanding citation -- before we move on to consider broader ethical concerns about research and issues that arise in collaborative learning and community based projects. Anti-colonial, critical race, feminist, and queer theories, and ethics of research will be foundational to this class.
Prerequisite: 3 credits from the WGSS Intro requirement course list: LGBT200, WGSS201, WGSS105, WGSS200, WGSS205, WGSS250, or WGSS263.
Restriction: Must be in an undergraduate program in the Harriet Tubman Department of Women, Gender, and Sexuality Studies.
Credit Only Granted for: WMST301 or WGSS301.
Formerly: WMST301.

WGSS302 Feminist, Critical Race, and Queer Theories (3 Credits)
Introduces students to some of the major concepts in feminist, critical race, and queer theories. It examines the questions: What is theory? What forms does theory take? What is the relationship between theory and practice? What is the role of theory in political and social action? In art? In personal life? What does it mean to do theory?
Prerequisite: 6 credits in LGBT, WMST, WGSS or courses that are cross-listed with these.
Credit Only Granted for: WMST302, WGSS302 or WMST400.
Formerly: WMST302.

WGSS305 Disability Justice (3 Credits)
Disability Justice examines disability as a category of analysis within intersecting systems of race, gender, sexuality, and class. Tracing the emergence of disability justice from feminist, queer, and critical race theory, the course engages humanistic methods to analyze historical and contemporary movements, social theory, and cultural production. Students will conduct independent and collaborative research projects, apply textual and archival analysis to activist and theoretical materials, and complete case studies on education, policy, or technology. Through critical writing, peer workshops, and community-based projects, students will develop the interpretive and practical skills necessary to connect humanistic inquiry with the principles of access, interdependence, and collective liberation.
Credit Only Granted for: WGSS319D or WGSS305.
Formerly: WGSS319D.

WGSS310 Transgender Studies (3 Credits)
Introduces students to the interdisciplinary field of transgender studies, providing a history of the field and engaging current debates within it. Students will explore the emergence and consolidation of trans identities, practices, cultures, and knowledges across medical, historical, sociological, cultural, and artistic contexts, paying particular attention to dynamics of race, class, and ability, to global and transnational difference, and to the implications of transgender studies for understanding gender and sexuality overall.
Prerequisite: LGBT200 .
Cross-listed with: LGBT310.
Credit Only Granted for: LGBT310, WMST310 or WGSS310.

WGSS314 Black Women in United States History (3 Credits)
Black American women's history from slavery to the present. Focused on gaining a fuller understanding of the effect of race, class and gender on the life cycles and multiple roles of Black women as mothers, daughters, wives, workers and social-change agents.
Cross-listed with: AAAS313.
Restriction: Sophomore standing or higher.
Credit Only Granted for: AASP313, AAAS313, WMST314 or WGSS314.
Formerly: WMST314.

WGSS315 Intro to Fat Studies: Fatness, Blackness and Their Intersections (3 Credits)
Examines fatness as an area of human difference subject to privilege and discrimination that intersects with other systems of oppression based on gender, race, class, sexual orientation, and ability. Though we will look at fatness as intersectional, this course will particularly highlight the relationship between fatness and Blackness. We approach this area of study through an interdisciplinary humanities and social-science lens which emphasizes fatness as a social justice issue. The course closes with an examination of fat liberation as liberation for all bodies with a particular emphasis on performing arts and activism as a vehicle for liberation and challenging fatmisia.

WGSS319 Workshops in Gender, Race, and Queer Studies (3 Credits)
Topics will change each semester but all workshops will be designed to have students think transdisciplinarily and interdisciplinarily about a specific topic or issue and to understand how differing approaches shape knowledge. Assignments within the workshops are aimed at students developing their skills in forms of presentation beyond the written essay, e.g. oral argument, digital or creative projects. Collaborative work must be central to all workshop courses; these collaborative activities do not preclude the possibility of individual research/writing assignments but the Workshops should emphasize conversation, debate, collaboration, and critique more so than the individually authored essay.
Repeatable to: 9 credits if content differs.
Formerly: WMST319.

WGSS320 Women in Classical Antiquity (3 Credits)
A study of women's image and reality in ancient Greek and Roman societies through an examination of literary, linguistic, historical, legal, and artistic evidence; special emphasis in women's role in the family, views of female sexuality, and the place of women in creative art. Readings in primary sources in translation and modern critical writings.
Cross-listed with: CLAS320, HIST328W.
Credit Only Granted for: CLAS320, WMST320, WGSS320 or HIST328W.

WGSS325 The Sociology of Gender (3 Credits)
Institutional bases of gender roles and gender inequality, cultural perspectives on gender, gender socialization, feminism, and gender-role change. Emphasis on contemporary American society.
Prerequisite: 3 credits in SOCY courses.
Cross-listed with: SOCY325.
Credit Only Granted for: SOCY325, WMST325 or WGSS325.
Formerly: WMST325.

WGSS326 Biology of Reproduction (3 Credits)
The biology of the reproductive system with emphasis on mammals and, in particular, on human reproduction. Hormone actions, sperm production, ovulation, sexual differentiation, sexual behavior, contraception, pregnancy, lactation, maternal behavior and menopause.
Prerequisite: BSCI170 and BSCI171; or BSCI105; or permission of the Harriet Tubman Department of Women, Gender, and Sexuality Studies; or permission of CMNS-Biological Sciences UG Program.
Cross-listed with: BSCI342.
Credit Only Granted for: BSCI342, WMST326 or WGSS326.
Formerly: WMST326.

WGSS336 Psychology of Women (3 Credits)
A study of the biology, life span development, socialization, personality, mental health, and special issues of women.
Prerequisite: PSYC100.
Cross-listed with: PSYC336.
Credit Only Granted for: PSYC336, WMST336 or WGSS 336.
Formerly: WMST336.

WGSS348 Literary Works by Women (3 Credits)
The context, form, style and meaning of literary works by women.
Prerequisite: Must have completed at least one lower-level English literature course and one other lower-level English course; or Permission of the Harriet Tubman Department of Women, Gender, and Sexuality Studies.
Cross-listed with: ENGL348.
Repeatable to: 6 credits if content differs.
Formerly: WMST348.

WGSS358 Undergraduate Teaching Assistantship (3 Credits)
Students work under the supervision of a faculty mentor to assist with an undergraduate LGBT or WGSS course while also becoming conversant in feminist, critical race, and queer pedagogical debates and approaches.
Restriction: Permission of the Harriet Tubman Department of Women, Gender, and Sexuality Studies.
Repeatable to: 9 credits.
Formerly: WMST358.

WGSS360 Caribbean Women (3 Credits)
An interdisciplinary analysis of the lives and experiences of women across the Caribbean region, through an examination of their roles in individual, national, social and cultural formations. Special emphasis on contemporary women's issues and organizations.
Cross-listed with: AAAS361.
Credit Only Granted for: WGSS360, WMST360, AAAS361 or AASP361.
Formerly: WMST360.

WGSS368 Undergraduate WGSS Internship (3-6 Credits)
Undergraduate Internship in a position related to women, gender, and sexuality studies and overseen by a member of the WGSS faculty.
Restriction: Permission of the Harriet Tubman Department of Women, Gender, and Sexuality Studies; and must have Learning Proposal approved by WGSS Academic Advisor; and junior standing or higher.
Repeatable to: 9 credits if content differs.
Formerly: WMST386 and WMST368.

WGSS369 Special Topics in Study Abroad III (1-6 Credits)
Special topics course taken as part of an approved study abroad program.
Repeatable to: 15 credits if content differs.
Formerly: WMST369.

WGSS370 Black Feminist Thought (3 Credits)
Examines the ideas, words and actions of Black women writers, speakers, artists, and activists in the United States.
Prerequisite: 1 course in AASP; or 1 course in WGSS.
Cross-listed with: AAAS371.
Credit Only Granted for: WMST370, WGSS370, AAAS371 or AASP371.
Formerly: WMST370.

WGSS378 Undergraduate Research and Creative Works Assistantship (1-3 Credits)
The Undergraduate Research Assistant provides an opportunity to develop a deep understanding of specific research methods and topics while involving the student in a professional role that requires ethical responsibility. The precise syllabus for the URA will be personalized to the student's interests and abilities, as well as to the specific research project and the Faculty Mentor's expectations. The student will meet with the Faculty Mentor prior to enrolling for a URA in order to determine the responsibilities and learning goals for the semester.
Restriction: Permission of the Harriet Tubman Department of Women, Gender, and Sexuality Studies.
Repeatable to: 9 credits if content differs.
Formerly: WMST378.

WGSS379 Topics in Women, Gender, and Sexuality Studies (1-3 Credits)
Thematic exploration of a topic in women, gender, and sexuality studies.
Repeatable to: 9 credits if content differs.
Formerly: WMST379.

WGSS408 Literature by Women Before 1800 (3 Credits)
Selected writings by women in the medieval and early modern era.
Prerequisite: Must have completed two English courses in literature; or permission of the Harriet Tubman Department of Women, Gender, and Sexuality Studies.
Cross-listed with: ENGL408.
Repeatable to: 9 credits if content differs.
Formerly: WMST408.

WGSS410 Women of the African Diaspora (3 Credits)
Explores the lives, experiences, and cultures of women of Africa and the African diaspora--African-America, the Caribbean, and Afro-Latin America. A variety of resources and materials will be used providing a distinctive interdisciplinary perspective.
Credit Only Granted for: WMST410 or WGSS410.
Formerly: WMST410.

WGSS420 Asian American Women: The Social Construction of Gender (3 Credits)
Examines the intersection of gender, race and class as it relates to Asian American women in the United States; how institutionalized cultural and social statuses of gender, race, ethnicity and social class produce and reproduce inequality with implications for Asian Americans and the broader society.
Cross-listed with: AAST420.
Restriction: Must not have completed WMST420.
Credit Only Granted for: AAST420, WMST420 or WGSS420.

WGSS422 Asian American Women and Gender (3 Credits)
Examines Asian/American cultural production along with theories of gender and sexuality in the field of Asian American Studies. We consider how Asian American femininities/masculinities are conceived and circulated, drawing from a diverse selection of twentieth-century and contemporary texts, films and images that connect Asian American bodies to ideas of absence, danger, inscrutability, hyper- or hypo-sexuality, and virulence. Beginning with early to mid-twentieth century representations, the course attends to theories that clarify the contested relationship between the East/West and Asia/U.S. Also examined are the methods through which bodies differentiated by sex, gender, and race are managed, surveilled, and rehabilitated, with close attention to the enduring legacies of American expansionism and conquest, anti-immigration policies in the U.S., and twentieth-century wars and occupations in Asia. The course engages Women of Color feminisms, queer theory, and disability studies.
Cross-listed with: AAST422.
Credit Only Granted for: AAST498G, AAST422, or WGSS 422.
Formerly: AAST498G.

WGSS425 Gender Roles and Social Institutions (3 Credits)
Relationship between gender roles and the structure of one or more social institutions (e.g., the economy, the family, the political system, religion, education). The incorporation of gender roles into social institutions; perpetuation or transformation of sex roles by social institutions; how changing gender roles affect social institutions.
Credit Only Granted for: SOCY425, WMST425 or WGSS425.
Formerly: WMST425.

WGSS428 Topics in Women, Gender, and Sexuality Studies (1-3 Credits)
Thematic exploration of a topic in women, gender, and sexuality studies.
Repeatable to: 9 credits if content differs.
Formerly: WMST428.

WGSS441 Feminism, AI, and Health (3 Credits)
Situated at the intersection of feminist theory, AI, and health care, this interdisciplinary course will investigate the sociopolitical and ethical implications of emerging technologies in medical contexts. Drawing on feminist critiques of technology, we will explore how systems of oppression--including sexism, racism, ableism, and colonialism--shape the design, deployment, and impact of AI in health care. Students will engage with scholarly texts, discussions, and activities to analyze the historical entanglement of gender, race, and health care; the epistemic foundations of feminist knowledge production; the ethics of datafication and surveillance; and the transformative potential of feminist praxis. Coursework will include case studies, debates, and a final project envisioning inclusive, justice-oriented futures for AI in health care.

WGSS444 Feminist Critical Theory (3 Credits)
Issues in contemporary feminist thought that have particular relevance to textual studies, such as theories of language, literature, culture, interpretation, and identity.
Prerequisite: WMST200, WGSS200, WMST250, WGSS250, or ENGL250.
Cross-listed with: ENGL444.
Credit Only Granted for: ENGL444, WMST444 or WGSS444.
Formerly: WMST444.

WGSS448 Literature by Women of Color (3 Credits)
Literature by women of color in the United States, Britain, and in colonial and post-colonial countries.
Prerequisite: Must complete two English courses in literature; or permission of the Harriet Tubman Department of Women, Gender, and Sexuality Studies.
Cross-listed with: ENGL448.
Repeatable to: 9 credits if content differs.
Formerly: WMST448.

WGSS452 Women in the Media (3 Credits)
Participation and portrayal of women in the mass media from colonial to contemporary times.
Cross-listed with: JOUR452.
Credit Only Granted for: JOUR452, WMST452 or WGSS452.
Formerly: WMST 452.

WGSS455 Women in Medieval Culture and Society (3 Credits)
Medieval women's identity and cultural roles: the condition, rank and rights of medieval women; their access to power; a study of women's writings and the constraints of social constructs upon the female authorial voice; and contemporary assumptions about women.
Cross-listed with: HIST495.
Credit Only Granted for: HIST495, WMST455 or WGSS455.
Formerly: WMST455.

WGSS456 Women and Society in the Middle East (3 Credits)
Examines the customs, values and institutions that have shaped women's experience in the Middle East in the past and in the contemporary Middle East.
Recommended: Prior coursework in Middle East studies or gender studies.
Cross-listed with: HIST492.
Credit Only Granted for: HIST492, WMST456 or WGSS456.
Formerly: WMST456.

WGSS457 Redefining Gender in the U.S., 1880-1935 (3 Credits)
Exploring changing perceptions of gender in the U.S., 1880-1935, and the impact of those changes on the day to day lives of men and women.
Credit Only Granted for: WGSS457 or WMST457.
Formerly: WMST457.

WGSS458 Literature by Women After 1800 (3 Credits)
Selected writings by women after 1800.
Prerequisite: Must have completed two English courses in literature; or permission of Harriet Tubman Department of Women, Gender, and Sexuality Studies.
Cross-listed with: ENGL458.
Repeatable to: 9 credits if content differs.
Formerly: WMST458.

WGSS468 Feminist Cultural Studies (3 Credits)
Each version of this course focuses on one or several forms of popular culture -- such as TV, music, film, cyber-culture, or genre fiction (for example, science fiction) -- and demonstrates how feminists value, critique and explain such forms. Tools of feminist cultural studies include economic and social analyses of power, race, sexuality, gender, class, nationality, religion, technology, and globalization processes.
Repeatable to: 9 credits if content differs.
Formerly: WMST468.

WGSS469 Study Abroad Special Topics IV (1-6 Credits)
Special topics course taken as part of an approved study abroad program.
Repeatable to: 15 credits if content differs.
Formerly: WMST469.

WGSS471 Women's Health (3 Credits)
The women's health movement from the perspective of consumerism and feminism. The physician-patient relationship in the gynecological and other medical settings. The gynecological exam, gynecological problems, contraception, abortion, pregnancy, breast and cervical cancer and surgical procedures. Psychological aspects of gynecological concerns.
Cross-listed with: HLTH471.
Restriction: Must be in a program in the Harriet Tubman Department of Women, Gender, and Sexuality Studies; or must be in a major within SPHL-Behavioral & Community Health department.
Credit Only Granted for: HLTH471, WMST471, or WGSS471..
Formerly: WMST471.

WGSS486 Advanced Feminist, Critical Race, and Queer Theories (3 Credits)
Provides undergraduates with a survey of foundational texts in the intersecting fields of feminist, critical race, and queer studies, as well as an overview of current scholarship in order to give students an opportunity to understand the origins and the development of these fields. This course is especially recommended for students interested in pursuing graduate education. Our discussions will be focused on the trajectories of these intellectual conversations as they have developed in the academy.
Prerequisite: WMST301 or permission of the Harriet Tubman Department of Women, Gender, and Sexuality Studies.

WGSS487 Advanced Projects Seminar in Gender, Race, and Queer Studies (3 Credits)
A research seminar that allows students to focus their developed skills on a single topic of their own choosing while meeting regularly in seminar to discuss, critique, support, and learn from their peers' projects and assessments. Students choose a topic based on their own interests and prior coursework, perform advanced research appropriate to the question, and formulate an appropriate method of presentation of their research findings. The culminating presentation may take the form of a written paper or a creative, digital, or activist project.
Prerequisite: WGSS301.
Restriction: Must be in an undergraduate program in the Harriet Tubman Department of Women, Gender, and Sexuality Studies.
Credit Only Granted for: WMST487 or WGSS487.
Formerly: WMST487.

WGSS488 Senior Seminar (3 Credits)
Seminar for advanced majors in women's studies or other students with appropriate preparation. Interdisciplinary topics will vary each semester.
Restriction: Permission of the Harriet Tubman Department of Women, Gender, and Sexuality Studies.
Repeatable to: 9 credits if content differs.
Formerly: WMST488.

WGSS489 Individual Research in Gender, Race and Queer Studies (3 Credits)
Allows students who wish to continue the research they began in WMST487 or WGSS487 to do so under the guidance of an individual faculty mentor. Each student taking this class will develop an individual syllabus based on the project on which they are working, with the goal of developing a work of scholarship specific to their interests that can serve as an entry point for graduate study or professional work.
Prerequisite: WMST487 or WGSS487.
Repeatable to: 9 credits.

WGSS491 Judaism and the Construction of Gender (3 Credits)
The study of Jewish culture, religious practice, communal authority, and literature through the frame of such critical categories of analysis as gender, sexuality, masculinity, power, ethics, and the feminine.
Prerequisite: 1 course in JWST; or 1 course in LGBT; or 1 course in WMST or WGSS.
Cross-listed with: JWST491.
Credit Only Granted for: JWST491, WMST491 or WGSS491.
Formerly: WMST491.

WGSS492 Sex, Gender, and Jewish Identity (3 Credits)
An exploration of Jewish embodiment, including dynamics related to biological sex, culturally-framed gender, and sexuality. Topics of discussion may include transgender and intersex Jews, stereotypes and gender performance, modesty, genetics, and body alteration. Focus is on contemporary Jewish culture, framed within the larger historical and textual tradition.
Prerequisite: 1 course in WGSS; or 1 course in JWST; or 1 course in LGBT; or permission of instructor.
Cross-listed with: JWST492, LGBT448W.
Credit Only Granted for: JWST492, JWST409G, LGBT448W, WMST498W or WGSS492.
Formerly: WMST498W and JWST409G.

WGSS496 African-American Women Filmmakers (3 Credits)
Examines the cinematic artistry of African-American women filmmakers and the ways in which these films address the dual and inseparable roles of race and gender.
Credit Only Granted for: WMST496 or WGSS496.
Formerly: WMST496.

WGSS497 Professional Development (1 Credit)
To assist students in thinking about the next step post-undergraduate degree and to think long term about the importance of their WMST degree in lifelong career, personal, and political development. This course will provide students an opportunity to reflect upon where they are going beyond the B.A. and develop ways to communicate how their coursework and experiences at UMD have prepared them for the next step. The course will focus on the practicalities of resume writing, internship or job searches, etc. but also on the specific challenges/opportunities of translating interdisciplinary training to professional internship or beyond-the B.A. sites. Students may take this course in preparation for their internship (working to select an appropriate internship that can translate well to post-undergraduate aspirations) or they may take it post-internship as they determine their post-graduation steps.
Prerequisite: 12 credits in LGBT, WMST or WGSS courses.
Restriction: Must have completed a minimum of 75 credits.
Credit Only Granted for: WMST497 or WGSS497.
Formerly: WMST497.

WGSS498 Advanced Special Topics in Women, Gender, and Sexuality Studies (1-3 Credits)
Advanced study of a thematic topic in women, gender, and sexuality studies.
Restriction: Permission of the Harriet Tubman Department of Women, Gender, and Sexuality Studies.
Repeatable to: 9 credits if content differs.
Formerly: WMST498.

WGSS498D Sex, Gender, and Sexuality in the Islamic World (3 Credits)

WGSS499 Independent Study (1-3 Credits)
Research and writing or specific readings on a topic selected by the student and supervised by a faculty member of the Women's Studies Department.
Prerequisite: 1 course in WMST or WGSS.
Restriction: Permission of the Harriet Tubman Department of Women, Gender, and Sexuality Studies.
Repeatable to: 9 credits if content differs.
Formerly: WMST499.

WMSX - Women's Studies Education Abroad

WMSX200 Gender, Equality, and Sexuality in Scandinavia (3 Credits)
Sweden is one of the most gender equal countries in the world and is well-known for its progressive culture supported by forward-thinking laws and legislation. This course explores how concepts of gender, body, sexuality and race intersect in current debates about changing family structures, children's rights, and new ethical dilemmas in a changing Scandinavia.
Cross-listed with: LGBX200.
Credit Only Granted for: WMSX200 or LGBX200.
Additional Information: This course is offered as part of the Maryland-in-Stockholm study abroad program. Students must apply for this program through Education Abroad: More information at ter.ps/UMStockholm. Education Abroad processes registrations for this course on behalf of students.

WMSX201 Sex Education and Sexual Reform in Europe (3 Credits)
Provides insight to the ways in which sexual reform and sex education has shaped not only the history of sexuality in Europe, but also the very core of the various national identities. We will look into the different movements, campaigns, policies, and public debates regarding sexuality. We will discover the ways in which sex and sexuality are conveyed in sexual education aimed at children and youth by reading and watching examples of sex educational material.
Cross-listed with: LGBX201.
Credit Only Granted for: WMSX201 or LGBX201.
Additional Information: This course is offered as part of the Maryland-in-Stockholm study abroad program. Students must apply for this program through Education Abroad: More information at ter.ps/UMStockholm. Education Abroad processes registrations for this course on behalf of students.

WMSX202 Transgender in Scandinavia (3 Credits)
This course explores the history of trans activism with a special focus on Sweden, and how legislative and medical discourses change how we think about gender identities and rights. We also explore topics such as transphobia, gender disclosure and HIV criminalization laws, reproductive rights, gender-neutral pronouns, transgender children and their families, and how race and class intersect with being trans.
Cross-listed with: LGBX202.
Credit Only Granted for: WMSX202 or LGBX202.
Additional Information: This course is offered as part of the Maryland-in-Stockholm study abroad program. Students must apply for this program through Education Abroad: More information at ter.ps/UMStockholm. Education Abroad processes registrations for this course on behalf of students.

WMSX203 Economics of Gender (3 Credits)
Decisions around marriage, children, and work are taken by everyone on the planet. In this class we look at the economic elements that forge those choices. Moreover, while women's roles have changed beyond recognition in a century, we are still plagued with a dramatic under-representation of women in senior economic roles and the fact that they appear underpaid vis a vis men for doing the same work. This course looks at the factors influencing such issues, providing often surprising results.
Additional Information: This course is offered as part of the Maryland-in-Stockholm study abroad program. Students must apply for this program through Education Abroad: More information at ter.ps/UMStockholm. Education Abroad processes registrations for this course on behalf of students.

WMSX204 Nice Girls, Bad Girls, and Bitches: British Women and Gender from the Vote to Thatcher (3 Credits)
Explores the words and experiences of British women in a century of rapid social, economic and cultural transformation - when what it meant to be a 'British woman' was itself revolutionized, through decolonization and immigration. We will determine the constraints on women in war and peace, politics, education and paid work, marriage, motherhood and family, and celebrate rebels and non-conformists.
Additional Information: This course is offered as part of the Arts & Humanities-in-London study abroad program. Students must apply for this program through Education Abroad: More information at https://globalmaryland.umd.edu/offices/education-abroad/program/11854. Education Abroad processes registrations for this course on behalf of students.

WMSX300 Feminism(s) (6 Credits)
Engages with contemporary feminist thought through literature, literary criticism, history and theory of feminism. It examines the significant debates and key concepts of feminist thought through a range of political and philosophical texts and encourages students to develop their own critical understanding of gender and equality issues in the contemporary period. Explores feminism in relation to Marxism, psychoanalysis, sexuality, post-structuralism, neo-liberalism and international feminism.
Additional Information: This course is offered as part of the ARHU-in-London study abroad program. Students must apply for this program through Education Abroad: More information at globalmaryland.umd.edu/offices/education-abroad/program/11854. Education Abroad processes registrations for this course on behalf of students.

WMSX301 The Rising Generation: Youth, Age and Protest in Post-War Britain (3 Credits)
Explores important empirical and methodological questions about age, gender and sexuality, using a case study of post-war Britain. Considers the histories of "muted groups" such as children, adolescents, women and LGBT people, while thinking about how the language used about such groups is used to structure power relations in society. Engages with the ways conservatives and radicals used the language of age and life-stage to construct visions of the future, and how the experience of childhood, adolescence, adulthood and old age changed in Britain between 1945 and 1979.

XPER - xFoundry

XPER433 Xperiment to Address Grand Challenges (3 Credits)
Students will collaborate with each other using creative approaches to address complex real-world challenges. You will develop skills for interdisciplinary teamwork, problem-solving, and idea testing through hands-on experiences and guided discussions and reflections. By the end, you will form a multidisciplinary team of co-innovators ready to design a solution to a well-defined, real-world problem.
Restriction: Permission required by the xFoundry Program.
Additional Information: For more information, and to request permission to enroll, visit https://xfoundry.umd.edu/xperience.

XPER444 Xperiment II: Bringing Your Idea to Life (3 Credits)
Students will work in teams to design, develop, and iterate on solutions for the grand challenge problem. This course aims to equip students with the strategic skills essential for the successful design and implementation of effective solutions. They will explore methodologies for validating the feasibility and viability of proposed solutions, with a strong emphasis on conducting thorough customer feedback analysis to refine and validate product concepts. By the end of this course, students will have a working and tested prototype of their solution, showcasing their applied knowledge and practical skills in addressing complex challenges. This is the second course in xFoundry's signature academic program.
Restriction: Must be in the Xperience academic program; and permission of department.
Additional Information: For more information on Xperiment, visit: xfoundry.umd.edu/programs/xperience/xperiment.

XPER455 Xperiment III: Scaling Your Grand Challenge Solution (3 Credits)
Student teams will refine their grand challenge solutions with feedback from mentors, design testing frameworks, and analyze results to guide decision-making. They will explore advanced marketing strategies, craft compelling messages and apply insights from successful campaigns to enhance project visibility. Additionally, the course emphasizes the necessary communication skills for conveying goals and outcomes alongside insights into revenue models for sustainable financial viability. By the end of this course, students will have designed a Minimum Viable Product
Restriction: Must be a student accepted into xFoundry's Xperiment Academic Track and permission of department.

GRADUATE APPROVED COURSES

A

- AASP - African American Studies (p. 474)
- AAST - Asian American Studies (p. 475)
- AGNR - Agriculture and Natural Resources (p. 475)
- AGST - Agricultural Science and Technology (p. 476)
- AMSC - Applied Mathematics & Scientific Computation (p. 478)
- AMST - American Studies (p. 480)
- ANSC - Animal Science (p. 482)
- ANTH - Anthropology (p. 484)
- AOSC - Atmospheric and Oceanic Science (p. 492)
- ARAB - Arabic (p. 496)
- ARCH - Architecture (p. 497)
- AREC - Agricultural and Resource Economics (p. 501)
- ARHU - Arts and Humanities (p. 504)
- ARMY - Army (p. 505)
- ARSC - Air Science (p. 506)
- ARTH - Art History & Archaeology (p. 506)
- ARTT - Art Studio (p. 507)
- ASTR - Astronomy (p. 509)

B

- BCHM - Biochemistry (p. 510)
- BEES - Behavior, Ecology, Evolution and Systematics (p. 512)
- BERC - Center for Study of Business, Ethics, Regulation, Crime (p. 512)
- BIOE - Bioengineering (p. 512)
- BIOL - Biology (p. 517)
- BIOM - Biometrics (p. 518)
- BIPH - Biophysics (p. 518)
- BISI - Biological Sciences (p. 519)
- BMGT - Business and Management (p. 520)
- BMSO - Online Business MS Programs (p. 527)
- BSCI - Biological Sciences Program (p. 529)
- BSOS - Behavioral and Social Sciences (p. 533)
- BSST - Terrorism Studies (p. 533)
- BUAC - Accounting and Information Assurance (p. 535)
- BUDT - Decision and Information Technologies (p. 541)
- BUFN - Finance (p. 544)
- BULM - Logistics, Business, and Public Policy (p. 550)
- BUMK - Marketing (p. 553)
- BUMO - Management and Organization (p. 555)
- BUSI - Part-Time MBA Program (p. 560)
- BUSM - Full-Time MBA Program (p. 566)
- BUSO - Online MBA Programs (p. 572)

C

- CBMG - Cell Biology & Molecular Genetics (p. 576)
- CCJS - Criminology and Criminal Justice (p. 576)
- CHBE - Chemical and Biomolecular Engineering (p. 580)
- CHEM - Chemistry (p. 587)
- CHIN - Chinese (p. 589)
- CHPH - Chemical Physics (p. 590)
- CLAS - Classics (p. 590)
- CLFS - Chemical and Life Sciences (p. 591)
- CMLT - Comparative Literature (p. 591)
- CMSC - Computer Science (p. 592)
- COMM - Communication (p. 600)
- CONS - Sustainable Development & Conservation Biology (p. 607)

D

- DANC - Dance (p. 607)
- DATA - Data (p. 609)

E

- ECON - Economics (p. 611)
- EDCI - Curriculum and Instruction (p. 622)
- EDCP - Education Counseling and Personnel Services (p. 623)
- EDHD - Education, Human Development (p. 627)
- EDHI - Education Leadership, Higher Ed and International Ed (p. 632)
- EDMS - Measurement, Statistics, and Evaluation (p. 635)
- EDPS - Education Policy Studies (p. 637)
- EDSP - Education, Special (p. 637)
- EDUC - Education (p. 644)
- EMBA - Executive MBA Program (p. 645)
- ENAE - Engineering, Aerospace (p. 648)
- ENCE - Engineering, Civil (p. 654)
- ENEE - Electrical & Computer Engineering (p. 663)
- ENES - Engineering Science (p. 673)
- ENFP - Engineering, Fire Protection (p. 677)
- ENGL - English (p. 680)
- ENMA - Engineering, Materials (p. 687)
- ENME - Engineering, Mechanical (p. 695)
- ENPM - Engineering, Professional Masters (p. 705)
- ENRE - Reliability Engineering (p. 711)
- ENSE - Systems Engineering (p. 712)
- ENSP - Environmental Science and Policy (p. 713)
- ENST - Environmental Science and Technology (p. 714)
- ENTM - Entomology (p. 719)
- ENTS - Telecommunications (p. 720)
- EPIB - Epidemiology and Biostatistics (p. 721)

F

- FILM - Film Studies (p. 726)
- FMSC - Family Science (p. 726)
- FREN - French (p. 730)

G

- GEOG - Geographical Sciences (p. 732)
- GEOL - Geology (p. 740)
- GERS - German Studies (p. 745)

- GREK - Greek (p. 747)
- GVPT - Government and Politics (p. 748)

H

- HACS - ACES-Cybersecurity (p. 753)
- HEBR - Hebrew (p. 755)
- HESI - Higher Ed, Student Affairs, and International Ed Policy (p. 755)
- HESP - Hearing and Speech Sciences (p. 756)
- HISP - Historic Preservation (p. 763)
- HIST - History (p. 764)
- HLHP - Health and Human Performance (p. 769)
- HLSA - Health Services Administration (p. 770)
- HLTH - Health (p. 773)

I

- IMMR - Immigration Studies (p. 778)
- INFM - Information Management (p. 778)
- INST - Information Studies (p. 779)
- ISRL - Israel Studies (p. 794)
- ITAL - Italian (p. 794)

J

- JAPN - Japanese (p. 795)
- JOUR - Journalism (p. 796)
- JWST - Jewish Studies (p. 801)

K

- KNES - Kinesiology (p. 803)
- KORA - Korean (p. 808)

L

- LARC - Landscape Architecture (p. 809)
- LATN - Latin (p. 811)
- LBSC - Library Science (p. 812)
- LGBT - Lesbian Gay Bisexual Transgender Studies (p. 814)
- LING - Linguistics (p. 814)

M

- MAIT - Masters in the Mathematics of Advanced Industrial Tech (p. 816)
- MATH - Mathematics (p. 817)
- MEES - Marine-Estuarine-Environmental Sciences (p. 822)
- MIEH - Maryland Institute for Applied Environmental Health (p. 826)
- MITH - Maryland Institute for Technology in the Humanities (p. 828)
- MLAW - MPower Undergraduate Law Programs (p. 829)
- MOCB - Molecular and Cell Biology (p. 829)
- MSML - Machine Learning (p. 829)
- MUED - Music Education (p. 830)
- MUSC - School of Music (p. 832)
- MUSP - Music Performance (p. 838)

N

- NACS - Neuroscience & Cognitive Science (p. 839)
- NAVY - Navy (p. 839)
- NFSC - Nutrition and Food Science (p. 840)

P

- PERS - Persian (p. 843)
- PHIL - Philosophy (p. 844)
- PHSC - Public Health Science (p. 845)
- PHYS - Physics (p. 847)
- PLCY - Public Policy (p. 851)
- PLSC - Plant Sciences (p. 857)
- PORT - Portuguese (p. 860)
- PSYC - Psychology (p. 861)
- PUAF - Public Policy (p. 869)

Q

- QMMS - Quantitative Methodology: Measurement and Statistics (p. 869)

R

- RDEV - Real Estate Development (p. 871)
- RELS - Religious Studies (p. 873)
- RUSS - Russian (p. 873)

S

- SLAA - Second Language Acquisition and Application (p. 874)
- SLLC - School of Languages, Literatures and Cultures (p. 875)
- SOCY - Sociology (p. 876)
- SPAN - Spanish (p. 884)
- SPHL - Public Health (p. 890)
- STAT - Statistics and Probability (p. 891)
- SURV - Survey Methodology (p. 894)

T

- TDPS - Theatre, Dance and Performance Studies (p. 901)
- THET - Theatre (p. 901)
- TLPL - Teaching and Learning, Policy and Leadership (p. 905)
- TLTC - Teaching and Learning Transformation Center (p. 921)
- TOXI - Toxicology (p. 921)

U

- UMEI - Maryland English Institute (p. 922)
- UNIV - University Courses (p. 922)
- URSP - Urban Studies and Planning (p. 922)
- USLT - Latina/o Studies (p. 924)

V

- VMSC - Veterinary Medical Sciences (p. 925)

W

- WGSS - Women, Gender and Sexuality Studies (p. 927)

AASP - African American Studies

AASP400 Directed Readings in African American Studies (3 Credits)
The readings will be directed by the faculty of African American Studies. Topics to be covered will be chosen to meet the needs and interests of individual students.
Prerequisite: AASP202 or AASP100.

AASP401 Research Directions in African-American Studies (3 Credits)
Utilizing a pro seminar format, this course offers an overview of recent research on the experiences of African Americans and the African diaspora. The course will cover selective topics from research portfolios of department faculty related to the status of African Americans and the diaspora across a number of topics. Students will read recent original research studies and discuss with the authors both the theoretical underpinnings of the research, the methods and evaluate the interpretations. This course fulfills the capstone requirement for African American studies majors and certificate students by providing an opportunity to consolidate and integrate a range of ideas encountered in the curriculum.
Restriction: Must have earned a minimum of 90 credits; and must be major in African-American Studies.

AASP402 Classic Readings in African American Studies (3 Credits)
Classic readings of the social, economic and political status of blacks and other minorities in the United States and the Americas.
Prerequisite: AASP202 or AASP100.

AASP411 Black Resistance Movements (3 Credits)
A comparative study of the black resistance movements in Africa and America; analysis of their interrelationships as well as their impact on contemporary pan-Africanism.
Prerequisite: AASP100.

AASP413 Gentrification: Have You Met the New Neighbors?: Issues of Belonging and Displacement in Urban Areas (3 Credits)
Explores and considers current scholarship on the history, modes and implications of the process of gentrification in various areas within the United States. The course will engage with history, culture, and policy factors related to the redevelopment of urban areas. Course texts will be interdisciplinary in their methodology and genre, and will include themes of race, gender, and class. These texts, combined with student engagement, class discussion, and directed assignments will help to develop a theoretical framework for the understanding of gentrification as systematic, profound and in most if not all cases, irreversibly detrimental.

AASP441 Science, Technology, and the Black Community (3 Credits)
Scientific knowledge and skills in solving technological and social problems, particularly those faced by the black community. Examines the evolution and development of African and African American contributions to science. Surveys the impact of technological changes on minority communities.
Prerequisite: HIST255, AASP202, or AASP100; or permission of BSOS-African American Studies department.

AASP443 Blacks and the Law (3 Credits)
The relationship between black Americans and the law, particularly criminal law, criminal institutions and the criminal justice system. Examines historical changes in the legal status of blacks and changes in the causes of racial disparities in criminal involvement and punishments.
Prerequisite: HIST255, AASP202, or AASP100; or permission of BSOS-African American Studies department.

AASP468 Special Topics in Africa and the Americas (3 Credits)
Cultural, historical and artistic dimensions of the African experience in Africa and the Americas.
Repeatable to: 6 credits if content differs.

AASP478 Humanities Topics in African American Studies (3 Credits)
Advanced studies in the humanities, often requiring prerequisites, focusing on the literary, artistic and philosophical contributions of Africans and African Americans.
Repeatable to: 6 credits if content differs.

AASP479 Special Research in African-American Studies (1-9 Credits)
Supervised research activity within the African American Studies Department. This course is for both majors and non-majors who seek to work for a faculty member on their research project(s) and/or work in their research lab as a Research Assistant (RA). The purpose of this course is to expose undergraduate students to theories and methods used to understand the lives and experiences of Black people across the diaspora via hands-on/applied research experience. A faculty member must agree to supervise your research activity before students can enroll for course credit.
Recommended: AASP210.
Restriction: Permission of BSOS- African American Studies department; and sophomore standing or higher.
Repeatable to: 9 credits.

AASP493 Feminist and Nationalist Thought in Black Communities (3 Credits)
The historical and theoretical foundations of feminist and nationalist thought in Black Communities will be examined. Further, we will discover why feminist and nationalist thought has been routinely ignored or misrepresented as disparate, if not oppositional, themes in Black intellectual and political life.
Prerequisite: AASP101 or AASP100.
Credit Only Granted for: AASP493 or AASP499W.
Formerly: AASP499W.

AASP498 Special Topics in Black Culture (3 Credits)
Advanced study of the cultural and historical antecedents of contemporary African and African American society. Emphasis on the social, political, economic and behavioral factors affecting blacks and their communities. Topics vary.
Prerequisite: AASP202 or AASP100.
Repeatable to: 6 credits if content differs.

AASP499 Advanced Topics in Public Policy and the Black Community (3 Credits)
Examination of specific areas of policy development and evaluation in black and other communities. Application of advanced tools of policy analysis, especially quantitative, statistical and micro-economic analysis.
Prerequisite: AASP301; or permission of BSOS-African American Studies department.
Repeatable to: 6 credits if content differs.

AASP602 Interdisciplinary Research Methods in Afro-American Studies (3 Credits)
The purpose of this course is to familiarize graduate students with both the interdisciplinary and multidisciplinary approaches that academics employ when producing scholarship in the field of Afro-American Studies. This will examine the contours of the field with an emphasis on work in both the social sciences and the arts and humanities.
Restriction: Permission of BSOS-African American Studies department; or permission of EDUC-Education Policy and Leadership department.

AASP611 Classic Texts and Contemporary Issues (3 Credits)
Through a review and analysis of classic texts of Black intellectuals, artists, writers, and activists, students will examine the compelling themes in African American life and scholarship.
Restriction: Permission of BSOS-African American Studies department.

AAST - Asian American Studies

AAST420 Asian American Women: The Social Construction of Gender (3 Credits)
Examines the intersection of gender, race and class as it relates to Asian American women in the United States; how institutionalized cultural and social statuses of gender, race, ethnicity and social class produce and reproduce inequality with implications for Asian Americans and the broader society.
Cross-listed with: WGSS420.
Restriction: Must not have completed WMST420.
Credit Only Granted for: AAST420, WMST420 or WGSS420.

AAST421 Asian American Public Policy (3 Credits)
Using Asian Pacific Americans as a case study, this course will analyze the development of public policy in America. Each week, topics such as community development, voting rights, and the movement to redress the wartime internment of Japanese Americans will serve as backdrops for discussion. We will explore the policy-making roles of legislators, judges, local and national political leaders, journalists, writers, unions, social movements, and community organizations.
Cross-listed with: AMST418N.
Credit Only Granted for: AAST421, AAST498M or AMST418N.
Formerly: AAST498M.

AAST422 Asian American Women and Gender (3 Credits)
Examines Asian/American cultural production along with theories of gender and sexuality in the field of Asian American Studies. We consider how Asian American femininities/masculinities are conceived and circulated, drawing from a diverse selection of twentieth-century and contemporary texts, films and images that connect Asian American bodies to ideas of absence, danger, inscrutability, hyper- or hypo-sexuality, and virulence. Beginning with early to mid-twentieth century representations, the course attends to theories that clarify the contested relationship between the East/West and Asia/U.S. Also examined are the methods through which bodies differentiated by sex, gender, and race are managed, surveilled, and rehabilitated, with close attention to the enduring legacies of American expansionism and conquest, anti-immigration policies in the U.S., and twentieth-century wars and occupations in Asia. The course engages Women of Color feminisms, queer theory, and disability studies.
Cross-listed with: WGSS422.
Credit Only Granted for: AAST498G, AAST422, or WGSS 422.
Formerly: AAST498G.

AAST424 Sociology of Race Relations (3 Credits)
Encourages sociological thinking about US racial and ethnic minority populations, with a focus on African Americans, Latinos, Asian Americans, and Native Americans. The central concern is to understand and explain racial/ethnic inequality. A wide array of topics are discussed, including prejudice and discrimination, slavery, residential segregation, cultural inequality, skin tone stratification, economic and educational disparities, and assimilation/generational processes.
Prerequisite: 6 credits in SOCY courses; or permission of the Sociology department.
Cross-listed with: SOCY424.
Credit Only Granted for: SOCY424 or AAST424.

AAST440 South Asian American Literature and Culture (3 Credits)
Examines writing by South Asian American authors and authors writing about South Asian American issues. It explores major South Asian diaspora themes, considering how migration, war, the events of 9/11, global capitalism, and the changing socio-political and racial scene have affected South Asians in the United States. We will use a transnational approach to consider how writers and filmmakers explore gender, class, religious, caste, and other differences amongst South Asian Americans. We will also examine the place of South Asian Americans in relation to other Asian American populations. We will consider how South Asian American texts disrupt traditional literary classifications based on national identities by reflecting the complex global conditions, imperialistic and capitalistic expansion, and interconnectedness of peoples, nations, and cultures that have transformed American literature and conceptions of American identity.
Credit Only Granted for: AAST440 or AAST498W.
Formerly: AAST498W.

AAST443 Asian American Politics (3 Credits)
Students will gain a greater understanding of 1) the role of Asian Americans in US politics, 2) the political attitudes and behaviors of Asian Americans and 3) how to conduct research on Asian American politics. Though the class will concentrate on Asian Americans, issues related to Asian American politics will be examined within the larger context of America's multicultural political landscape.
Cross-listed with: AMST498J, GVPT368C.
Credit Only Granted for: AAST498T, AAST443, GVPT368C or AMST 498J.
Formerly: AAST498T.

AAST498 Advanced Topics in Asian American Studies (3 Credits)
Advanced study of the cultural and historical antecedents of contemporary Asian American society. Emphasis on the social, political, economic, and behavioral factors affecting Asian Americans and their communities.
Repeatable to: 6 credits if content differs.

AAST499 Senior Thesis (3 Credits)
Under the supervision of faculty, research regarding a specific topic of the Asian American experience will be completed.
Prerequisite: AAST201 and AAST200.
Restriction: Permission of UGST-Undergraduate Studies; and must be in Asian American Studies program.
Repeatable to: 6 credits if content differs.

AGNR - Agriculture and Natural Resources

AGNR489 Field Experience (1-4 Credits)
Credit according to time scheduled and organization of the course. A lecture series organized to study in depth a selected phase of agriculture not normally associated with one of the existing programs.
Restriction: Permission of AGNR-College of Agriculture & Natural Resources.
Repeatable to: 4 credits if content differs.
Formerly: AGRI489.

AGNR499 Special Problems (1-3 Credits)
Formerly: AGRI499.

AGNR661 Rural Community Analysis (3 Credits)
Communities as social systems composed of organizations which interact in a system of cultural institutions, norms, and values. Functional and structural linkages between organizations within as well as outside the community; rural vs. urban similarities and differences; and the role of the social processes such as competition, cooperation and conflict in the context of community power and leadership structure.
Formerly: AGRI661.

AGNR699 Special Problems (1-3 Credits)
Formerly: AGRI699.

AGNR789 Special Topics (1-3 Credits)
Repeatable to: 9 credits if content differs.
Formerly: AGRI789.

AGNR798 Seminar in Rural Education (1-3 Credits)
Problems in the organization, administration, and supervision of the several agencies of rural and/or vocational education.
Repeatable to: 8 credits if content differs.
Formerly: AGRI798.

AGNR799 Master's Thesis Research (1-6 Credits)
Formerly: AGRI799.

AGNR888 Apprenticeship in Education (1-8 Credits)
Apprenticeships in the major area of study are available to selected students whose application for an apprenticeship has been approved by the education faculty. Each apprentice is assigned to work for at least a semester full-time or the equivalent with an appropriate agency. The sponsor of the apprentice maintains a close working relationship with the apprentice and the other persons involved.
Prerequisite: Must have completed 6 credits in Education at the University of Maryland.
Restriction: Must have experience and must have a master's degree.
Formerly: AGRI888.

AGNR889 Internship in Education (3-8 Credits)
Internships in the major area of study for experienced students who are assigned to an appropriate school system, educational institution, or agency in a situation different than that in which the student is regularly employed.
Formerly: AGRI889.

AGNR899 Doctoral Dissertation Research (1-8 Credits)
Formerly: AGRI899.

AGST - Agricultural Science and Technology

AGST130 Did Yeast Create Civilization? (3 Credits)
Did yeast create civilization? Fermented foods have played a major role in the transition from nomadic to settled agrarian societies, the establishment of social and religious customs, the expansion of empires, and modern economies. To what extent are our past and current attitudes towards fermented foods rooted in historical and cultural imprints? Explore the central role of fermentation in human history and culture, the basic microbiological processes underlying fermentation processes, and the processes used to produce and distribute fermented foods. Find out how the fruits, grains, and dairy products used to produce fermented foods are grown and selected. Students will learn about the development and modern use of fermented dairy products, pickles, bread, tea, chocolate, wine, beer, distilled liquors, and pharmaceutical/manufactured products.
Recommended: CHEM103, CHEM131, CHEM135, or CHEM146.
Cross-listed with: PLSC130.
Credit Only Granted for: AGST130 or PLSC130.

AGST275 Fundamentals of Agricultural and Environmental Chemistry (3 Credits)
An in-depth discussion of chemistry targeted to students enrolled in plant and animal management curricula offered in AGNR. Covers the nomenclature and basic functional groups in organic chemistry, natural products and pesticides. Current practices of crop, agriculture and environmental management and genetic engineering also discussed.
Prerequisite: Minimum grade of C- in CHEM131 and CHEM132; and minimum grade of C- in (PLSC110 and PLSC11) or (PLSC112 and PLSC113) or (BSCI160 and BSCI161) or (BSCI170 and BSCI171).
Restriction: Must not have completed CHEM104 or CHEM105; and must be in a major within the AGNR-College of Agriculture and Natural Resources; or permission of instructor.
Credit Only Granted for: AGST275 or PLSC275.
Formerly: PLSC275.

AGST333 Crafty Beverage Crops (3 Credits)
From soda to wine, a scientific introduction to "crafty beverage crops". Students will expand their horticulture knowledge and gain an appreciation for craft beverages and the plants that made them. Topics include history, biology, production and management techniques, harvest, storage and market potential for crafty beverage crops.
Recommended: PLSC110 or PLSC112; or 1 course in BSCI, BCHM, BIOL.

AGST389 Internship in Agricultural Education (1-3 Credits)
An experiential learning course with a focus on non-formal agricultural education. This is a supervised learning experience within a career focused environment to assist in refinement of a student's career interests prior to graduation.
Restriction: Permission of the instructor.
Repeatable to: 6 credits if content differs.

AGST399 Special Problems in Agricultural Science & Technology (1-3 Credits)
A problem based learning course with a focus on class or group based research projects in Agricultural Science and Technology with a focus on addressing outreach targeted needs.
Restriction: Permission of the instructor.
Repeatable to: 6 credits if content differs.

AGST400 Advanced Crop Science (3 Credits)
Focuses on the study of the agronomic principles and practices required for the production of food, feed, fiber and fuel crops. This is a project-based course where students will develop a farm plan from knowledge gained in previous courses and built upon in this course. Students will learn to integrate data and information from many sources in order to build and operate a successful and sustainable agronomic farm operation using current and new technology. The use of farm management software will be an integral part of the course and farm project.
Prerequisite: PLSC112, PLSC113, BSCI160, BSCI161, and MATH113 or higher.
Recommended: ANSC101.
Credit Only Granted for: PLSC407 or AGST400.
Formerly: PLSC407.
Additional Information: There will be two required Saturday field trips during the semester. Because of the changing nature of agriculture, the dates of these field trips will be decided upon at the beginning of the semester by discussion among the students and based on cooperators availability and environmental factors. Students will have a minimum of two weeks notice as to the dates of the field trips.

AGST401 Tractor and Equipment Operation, Safety and Maintenance (1 Credit)
Provides students with basic skills needed to safely operate and maintain farm equipment, such as tractors and implements used in agronomic production. Students will receive introductory background training in the basic safety and operation of tractors through hands-on learning. Emphasis will also be placed on the mechanical functioning of equipment and the functional similarities and differences between gasoline (two-stroke and four-stroke) and diesel engines as well as electric motors as they relate to farm equipment (mobile and stationary). This knowledge will be used to teach students to safely perform basic care and maintenance of different tractor types as well as various implements. Students will also learn basic implement connection and disconnection, including the safe use of implements that employ a power take-off unit. Included in the course will be an introduction to the equipment and use of satellite navigation systems used in agronomic production.
Prerequisite: PLSC112 and PLSC113; MATH113 or higher MATH course; and must have completed or be concurrently enrolled in AGST400.
Restriction: Must be in the Agricultural Science and Technology major (01010) with priority given to Agronomy students (0101A); and must have earned a minimum of 60 credits; and permission of the Department of Plant Sciences and Landscape Architecture.
Additional Information: Course location will be the University of Maryland Wye Research & Education Center, Queenstown, Maryland. Because students will be working around machinery with moving parts, there is a strict dress code based on information from the United State Department of Agriculture Cooperative States Research, Education and Extension Service's Hazardous Occupations Safety Training for Agriculture (HOSTA), National Safe Tractor and Machinery Operation Program (NSTMOP) standards. YContact instructor for more information?.

AGST426 Scientists Teaching and Translating Science (3 Credits)
Explore methods in pedagogy, andragogy, and heutagogy to facilitate science learning through the development of a teaching philosophy, outreach teaching skills, motivation in learning, assessment foundations, and review of current literature on instruction in science fields.
Credit Only Granted for: AGST426 or PLSC489L.
Formerly: PLSC489L.

AGST440 Exploring Maryland Agriculture, Agricultural Industry, and Agricultural Literacy (3 Credits)
Explore the mission and history of the Land Grant System as well as current work conducted through the University of Maryland to extend research to citizens. Often referred to as America in miniature, Maryland boasts diverse people, agricultural practices, cultures, and ecosystems which students will examine to perceive the decision making processes within and across ecological systems as well as the development of advisory boards.

AGST442 Examining Leadership in Youth and Volunteers (3 Credits)
Explore fundamental leadership theories and practice related skills utilized in helping youth and adults build community relationships in a variety of teaching environments. Fundamentals of youth development will be the basis for examining how to foster positive learning environments for dynamic learning. The identification of empowerment processes will be explored through case-study discussions.

AGST489 Special Topics in Agricultural Science and Technology (1-3 Credits)
Selected novel topics of study in Agricultural Science & Technology (AGST).
Restriction: Permission of the instructor.
Repeatable to: 9 credits if content differs.

AGST499 Independent Studies in Agricultural Science and Technology (1-3 Credits)
An inquiry based learning course with individualized projects designed by student and faculty focused on: research or advanced learning experiences in Agricultural Science and Technology including field, greenhouse, laboratory, educational site, travel abroad and/or library studies. Conducted under the direction of a faculty member.
Restriction: By permission of instructor.
Repeatable to: 6 credits if content differs.

AGST605 Extension Research Methods with Applied Data Analysis (3 Credits)
Examine foundational qualitative and quantitative research methods in real-world social and behavioral settings for extension and outreach educators. This course enables you to distinguish, select and apply research methods to conduct social science research in a non-formal education setting. A variety of data analysis approaches will be examined across Extension and outreach education applications.

AGST606 Program Planning and Evaluation in Agricultural and Extension Education (3 Credits)
Learn how to plan and evaluate agricultural and extension education programs: design and administer needs assessments, create a logic model, apply quantitative and qualitative instruments and protocols, engage stakeholders, and gather and analyze data. The course will enable participants to develop an evaluation and program plan tailored to their interest/working area, applying a lens to address inclusion and equity issues.
Credit Only Granted for: AGNR606 or AGST606.
Formerly: AGNR606.

AGST630 Adult and Community Development Education (3 Credits)
Analyze and learn to apply teaching/learning theory and techniques in adult continuing and community development education with a focus on nonformal contexts. This course will examine the curriculum development process as well as in-person, virtual, and remote instructional techniques and methodologies tailored to adults' learning preferences. Scenarios and examples will involve participatory approaches to solving community development problems.
Credit Only Granted for: AGNR630 or AGST630.
Formerly: AGNR630.

AGST640 Analysis of Maryland Agriculture (3 Credits)
An advanced research focused course on examining the mission and history of the Land Grant System as well as appraising the current work conducted through the University of Maryland Extension to extend research to citizens. Often referred to as America in miniature, Maryland boasts diverse people, agricultural practices, cultures, and ecosystems which students will examine to perceive the decision making processes within and across ecological systems. An enriching field practicum with an agricultural agency is required.

AGST689 Special Topics in Agricultural Science and Technology (1-3 Credits)
Selected advanced novel topics of study in Agricultural Science and Technology (AGST).
Restriction: Permission of the instructor.
Repeatable to: 9 credits if content differs.

AGST699 Advanced Independent Studies in Agricultural Science and Technology (1-3 Credits)
An inquiry based learning course with individualized advanced projects designed by graduate student and faculty focused on: research projects in Agricultural Science and Technology including field, greenhouse, laboratory, educational site, travel abroad and/or library studies. Conducted under the direction of a faculty member.
Restriction: By permission of instructor only.
Repeatable to: 6 credits if content differs.

AGST799 Master's Thesis Research (1-6 Credits)
Development of a terminal thesis on a problem in extension education, designed to demonstrate comprehensive skills and knowledge achieved in the graduate program. The subject will be selected in consultation with an advisor and periodically reviewed with a committee headed by the advisor.
Restriction: Permission of instructor.
Repeatable to: 9 credits.

AMSC - Applied Mathematics & Scientific Computation

AMSC420 Mathematical Modeling (3 Credits)
The course will develop skills in data-driven mathematical modeling through individual and group projects. Emphasis will be placed on both analytical and computational methods, and on effective oral and written presentation of results.
Prerequisite: 1 course with a minimum grade of C- from (MATH240, MATH461, MATH341, ENEE290, MATH243); and 1 course with a minimum grade of C- from (MATH241, MATH340); and 1 course with a minimum grade of C- from (MATH246, MATH341, ENEE290, MATH243); and 1 course with a minimum grade of C- from (STAT400, STAT410); and 1 course with a minimum grade C- from (CMSC106, CMSC131).
Recommended: AMSC460 or AMSC466.
Cross-listed with: MATH420.
Credit Only Granted for: AMSC420 or MATH420.

AMSC452 Introduction to Dynamics and Chaos (3 Credits)
An introduction to mathematical dynamics and chaos. Orbits, bifurcations, Cantor sets and horseshoes, symbolic dynamics, fractal dimension, notions of stability, flows and chaos. Includes motivation and historical perspectives, as well as examples of fundamental maps studied in dynamics and applications of dynamics.
Prerequisite: MATH341; or MATH246 and one of (MATH240 or MATH461).
Cross-listed with: MATH452.
Credit Only Granted for: AMSC452 or MATH452.

AMSC460 Computational Methods (3 Credits)
Basic computational methods for interpolation, least squares, approximation, numerical quadrature, numerical solution of polynomial and transcendental equations, systems of linear equations and initial value problems for ordinary differential equations. Emphasis on methods and their computational properties rather than their analytic aspects. Intended primarily for students in the physical and engineering sciences.
Prerequisite: 1 course with a minimum grade of C- from (MATH240, MATH341, MATH461, ENEE290, MATH243); and 1 course with a minimum grade of C- from (MATH241, MATH340); and 1 course with a minimum grade of C- from (CMSC106, CMSC131); and 1 course with a minimum grade of C- from (MATH246, MATH341, ENEE290, MATH243).
Cross-listed with: CMSC460.
Credit Only Granted for: AMSC460, AMSC466, CMSC460, or CMSC466.

AMSC466 Introduction to Numerical Analysis I (3 Credits)
Floating point computations, direct methods for linear systems, interpolation, solution of nonlinear equations.
Prerequisite: 1 course with a minimum grade of C- from (CMSC106, CMSC131); and minimum grade of C- in MATH410.
Cross-listed with: CMSC466.
Credit Only Granted for: AMSC460, CMSC460, AMSC466, or CMSC466.

AMSC498 Selected Topics in Applied Mathematics (1-3 Credits)
Topics in applied mathematics of special interest to advanced undergraduate students.
Repeatable to: 6 credits if content differs.

AMSC660 Scientific Computing I (3 Credits)
Fundamental techniques in scientific computation with an introduction to theory and software for each topic. Computer numbers and sources of errors, numerical linear algebra, optimization, and Monte Carlo methods.
Prerequisite: Must have knowledge of Matlab or Python.
Cross-listed with: CMSC660.
Credit Only Granted for: AMSC660 or CMSC660.

AMSC661 Scientific Computing II (3 Credits)
Numerical methods for solving ordinary and partial differential equations (elliptic, parabolic, hyperbolic, and dispersive): motivation, analysis, and implementation. Finite difference methods, finite element methods, Fourier and Chebyshev spectral methods, and meshless methods.
Prerequisite: Must have knowledge of Matlab or Python. Must have basic knowledge of ordinary and partial differential equations (MATH246 and MATH462 or equivalent, or permission of instructor).
Cross-listed with: CMSC661.
Credit Only Granted for: AMSC661 or CMSC661.

AMSC662 Computer Organization and Programming for Scientific Computing (3 Credits)
This course presents fundamental issues of computer hardware, software parallel computing, and scientific data management for programming for scientific computation.
Prerequisite: Must have Knowledge of C or Fortran.
Cross-listed with: CMSC662.
Credit Only Granted for: AMSC662 or CMSC662.

AMSC663 Advanced Scientific Computing I (3 Credits)
In the sequence Advanced Scientific Computing I & Advanced Scientific Computing II, (CMSC663/CMSC663 and AMSC664/CMSC664, respectively) students work on a year-long individual project to develop software for a scientific task in a high performance computing environment. Lectures will be given on available computational environments, code development, implementation of parallel algorithms.
Prerequisite: AMSC660 or CMSC660; and (AMSC661 or CMSC661).
Cross-listed with: CMSC663.
Restriction: Permission of instructor.
Credit Only Granted for: AMSC663 or CMSC663.

AMSC664 Advanced Scientific Computing II (3 Credits)
In the sequence Advanced Scientific Computing I & Advanced Scientific Computing II, (AMSC663/CMSC663 and CMSC664/CMSC664, respectively) students work on a year-long individual project to develop software for a scientific task in a high performance computing environment. Lectures will be given on available computational environments, code development, implementation of parallel algorithms.
Prerequisite: AMSC663 or CMSC663.
Cross-listed with: CMSC664.
Restriction: Permission of instructor.
Credit Only Granted for: AMSC664 or CMSC664.

AMSC666 Numerical Analysis I (3 Credits)
Approximation theory, numerical solution of initial-value problems, iterative methods for linear systems, optimization.
Prerequisite: CMSC466 or AMSC466; and MATH410.
Cross-listed with: CMSC666.
Credit Only Granted for: AMSC666 or CMSC666.

AMSC670 Ordinary Differential Equations I (3 Credits)
Existence and uniqueness, linear systems usually with Floquet theory for periodic systems, linearization and stability, planar systems usually with Poincare-Bendixson theorem.
Prerequisite: MATH405.
Cross-listed with: MATH670.
Credit Only Granted for: AMSC670 or MATH670.

AMSC671 Ordinary Differential Equations II (3 Credits)
The content of this course varies with the interests of the instructor and the class. Stability theory, control, time delay systems, Hamiltonian systems, bifurcation theory, and boundary value problems.
Prerequisite: MATH630.
Cross-listed with: MATH671.
Credit Only Granted for: AMSC671 or MATH671.

AMSC673 Partial Differential Equations I (3 Credits)
Analysis of boundary value problems for Laplace's equation, initial value problems for the heat and wave equations. Fundamental solutions, maximum principles, energy methods. First order nonlinear PDE, conservation laws. Characteristics, shock formation, weak solutions. Distributions, Fourier transform.
Prerequisite: MATH411; or students who have taken courses with comparable content may contact the department.
Cross-listed with: MATH673.
Credit Only Granted for: AMSC673 or MATH673.

AMSC674 Partial Differential Equations II (3 Credits)
Boundary value problems for elliptic partial differential equations via operator-theoretic methods. Hilbert spaces of functions. Duality, weak convergence. Sobolev spaces. Spectral theory of compact operators. Eigenfunction expansions.
Prerequisite: MATH673 or AMSC673; or permission of instructor.
Cross-listed with: MATH674.
Credit Only Granted for: AMSC674 or MATH674.

AMSC689 Research Interactions in Applied Mathematics and Scientific Computation (1-3 Credits)
The students participate in a vertically integrated (undergraduate, graduate and/or postdoctoral, faculty) research group. Format varies, but includes regular meetings, readings and presentations of material. See graduate program's online syllabus or contact the graduate program director for more information.
Restriction: Permission of instructor.
Repeatable to: 6 credits if content differs.

AMSC698 Advanced Topics in Applied Mathematics (1-4 Credits)
Repeatable to: 99 credits if content differs.

AMSC699 Applied Mathematics Seminar (1-3 Credits)
Seminar to acquaint students with a variety of applications of mathematics and to develop skills in presentation techniques.
Repeatable to: 99 credits if content differs.

AMSC714 Numerical Methods For Stationary PDEs (3 Credits)
Topics include: Maximum principle, finite difference method, upwinding, error analysis; Variational formulation of elliptic problems, inf-sup theory; The finite element method and its implementation; Piecewise polynomial interpolation theory in Sobolev spaces; A priori and a posteriori error analyses, adaptivity; Fast solvers; Variational crimes; Mixed finite element methods.
Prerequisite: One graduate level course in partial differential equations or one graduate level course in numerical analysis or scientific computing; or permission of instructor.
Credit Only Granted for: AMSC 714 or AMSC 614.
Formerly: AMSC614.
Additional Information: This course is a complement to the graduate courses MATH 673 and MATH 674 in PDEs, AMSC 666 in numerical analysis, and AMSC 660 and AMSC 661 in scientific computing.

AMSC715 Numerical Methods for Evolution Partial Differential Equations (3 Credits)
Topics include: Heat and wave equations: maximum principle, energy methods and Sobolev spaces, finite difference and finite element methods, von Neumann analysis, stability and error estimates;Linear first order PDEs: upwinding and monotone schemes, finite difference, finite volume, and discontinuous Galerkin methods; Nonlinear conservation laws: weak solutions and entropy conditions,monotone methods.
Prerequisite: Permission of instructor; or one graduate level course in partial differential equations or one graduate level course in numerical analysis or scientific computing.
Credit Only Granted for: AMSC612 or AMSC715.
Formerly: AMSC612.
Additional Information: This course continues AMSC 714, but can be taken independently, and is a complement to the graduate courses MATH 673 and MATH 674 in PDEs, AMSC 666 in numerical analysis, and AMSC 660 and AMSC 661 in scientific computing.

AMSC721 Mathematical Population Biology (3 Credits)
Foundational principles for modeling and analysis of real-life phenomena in population biology. Topics include design and analysis of models for general classes of unstructured (single species discrete-time and continuous-time, interacting populations etc.) and structured (spatially-structured, age- structured, sex-structured) population biology models in ecology and epidemiology, dynamics analysis of population biology models (asymptotic stability and bifurcation theory), numerical discretization of continuous-time models, statistical analysis (parameter estimation, uncertainty quantification).
Prerequisite: Calculus, differential equations, modeling, linear algebra, familiarity with mathematical software and programming languages (e.g., MATLAB, R, Python etc.); or permission of instructor.
Cross-listed with: MATH721.
Credit Only Granted for: AMSC721, BIOL721 or MATH721.
Additional Information: Open to advanced undergraduates by permission of instructor.

AMSC760 Applied Statistics Practicum (3 Credits)
A semester-long applied statistical project (a minimum 10 hours per week or 120 hours in total), in an internship or collaborative research-laboratory setting working on a substantive applied quantitative project with significant statistical content. One option for the collaborative project is training in statistical consulting, with activities consisting of training and role-playing sessions with the Course Instructor coupled with actual non-paid short-term consulting sessions with campus graduate student and faculty clients about statistical aspects of their research.
Prerequisite: Must have completed one year of graduate study in Applied Statistics.
Restriction: Must have approved AMSC760 project proposal.

AMSC761 Applied Statistics Seminar (1 Credit)
Seminar taught once yearly on a rotating basis by faculty engaged in the Applied Statistics area. Required of AMSC Applied Statistics area doctoral students within one year following the completion of their practicum project, AMSC760, and open only to Applied Statistics Area students. The seminar will include sessions on presentation skills, but will consist primarily of oral presentations of students' past Practicum project results. Students attend throughout the term, give one talk (at least 1/2 hour).
Recommended: STAT700 or STAT701; and (STAT740 or STAT741).

AMSC762 Data Analysis Project (1 Credit)
This course cannot be used to meet any of the Applied Statistics Area's seminar requirements. Offered yearly, required of and limited to MS non-thesis and doctoral students in Applied Statistics Area, for whom the resulting projects serve as a Qualifying Exam component. After 5-6 lectures or presentations on components of successful data analyses and write-ups, 3-4 sessions will discuss previous student project submissions. The culminating project, to be completed in a two week period between semesters, is an analysis and written report of one of three project choices made available each year to represent a spectrum of realistic applied statistical problems.
Restriction: Permission of CMNS-Applied Mathematics department; and permission of instructor.

AMSC763 Advanced Linear Numerical Analysis (3 Credits)
Advanced topics in numerical linear algebra, such as dense eigenvalue problems, sparse elimination, iterative methods, and other topics.
Prerequisite: AMSC666 or CMSC666; or permission of instructor.
Cross-listed with: CMSC763.
Credit Only Granted for: AMSC600, AMSC763, CMSC760, or CMSC763.
Formerly: AMSC600 and CMSC760.

AMSC764 Advanced Numerical Optimization (3 Credits)
Modern numerical methods for solving unconstrained and constrained nonlinear optimization problems in finite dimensions. Design of computational algorithms and the analysis of their properties.
Prerequisite: MATH410; or permission of instructor. Cross-listed with C MSC764.
Credit Only Granted for: AMSC607, AMSC764 or CMSC764. F ormerly: AMSC607.

AMSC799 Master's Thesis Research (1-6 Credits)

AMSC808 Advanced Topics in Applied Mathematics (1-3 Credits)
Advanced topics of current interest.
Restriction: Permission of instructor.
Repeatable to: 18 credits.

AMSC819 Applied Mathematics Seminar (1-3 Credits)
Advanced topics of current interest.
Restriction: Permission of instructor.
Repeatable to: 18 credits.

AMSC898 Pre-Candidacy Research (1-8 Credits)

AMSC899 Doctoral Dissertation Research (1-8 Credits)

AMST - American Studies

AMST418 Cultural Themes in America (3 Credits)
Examination of structure and development of American culture through themes such as "growing up American," "culture and mental disorders," "race," "ethnicity," "regionalism," "landscape," and "humor."
Repeatable to: 6 credits if content differs.

AMST418N Asian American Public Policy (3 Credits)
Using Asian Pacific Americans as a case study, this course will analyze the development of public policy in America. Each week, topics such as community development, voting rights, and the movement to redress the wartime internment of Japanese Americans will serve as backdrops for discussion. We will explore the policy-making roles of legislators, judges, local and national political leaders, journalists, writers, unions, social movements, and community organizations.
Cross-listed with: AAST421.
Credit Only Granted for: AAST421, AAST498M or AMST418N.
Formerly: AAST498M.

AMST425 Film and American Landscape (3 Credits)
Explores how representations of various geographic spaces in American film impact our understanding of community, identity, and place. In particular, we will think about how these spaces are culturally produced and changeable rather than static. The same space can hold diverse meanings for various groups of people and how such a space is represented in film is often wrapped up with issues of power, the reinforcement of stereotypes, and the creation of self/other dichotomies. By analyzing a variety of narrative, documentary, major studio, and independent films, we will seek to understand how American films' representations of rural, urban, and suburban spaces both reflect, contradict, and often influence our lived experiences of these spaces; in other words, this course will examine how the "reel" intersects with the "real".
Credit Only Granted for: AMST418K or AMST425.
Formerly: AMST418K.

AMST428 American Cultural Eras (3 Credits)
Investigation of a decade, period, or generation as a case study in significant social change within an American context. Case studies include "Antebellum America, 1840-1860" and "American culture in the Great Depression."
Repeatable to: 6 credits if content differs.

AMST429 Perspectives on Popular Culture (3 Credits)
Topics in popular culture studies, including the examination of particular genres, themes, and issues.
Repeatable to: 6 credits if content differs.

AMST450 Seminar in American Studies (3 Credits)
Developments in theories and methods of American Studies scholarship, with emphasis upon interaction between the humanities and the social sciences in the process of cultural analysis and evaluation.
Prerequisite: AMST201 and AMST340; and 1 course in AMST.
Restriction: Senior standing; and must be in American Studies program.

AMST498 Special Topics in American Studies (3 Credits)
Topics of special interest.
Repeatable to: 9 credits if content differs.

AMST498J Asian American Politics (3 Credits)
Students will gain a greater understanding of 1) the role of Asian Americans in US politics, 2) the political attitudes and behaviors of Asian Americans and 3) how to conduct research on Asian American politics. Though the class will concentrate on Asian Americans, issues related to Asian American politics will be examined within the larger context of America's multicultural political landscape.
Cross-listed with: AAST443, GVPT368C.
Credit Only Granted for: AAST498T, AAST443, GVPT368C or AMST 498J.
Formerly: AAST498T.

AMST499 Independent Studies (1-3 Credits)
Provides the student with the opportunity to pursue independent, interdisciplinary research and reading in specific areas of American culture studies.
Restriction: Permission of ARHU-American Studies department; and must be in American Studies program.
Repeatable to: 6 credits if content differs.

AMST601 Introductory Theories and History in American Studies (3 Credits)
Explores the formative literature, theories, research approaches, and history of American Studies.
Restriction: Must not be a Graduate Advanced Special Student.

AMST602 Interdisciplinary Research Methods and Bibliographic Instruction (3 Credits)
Advanced instruction interdisciplinary research strategies, bibliography, and the structure of systems of scholarly communication in the fields and subfields of American Studies.

AMST603 Current Approaches to American Studies (3 Credits)
Builds on AMST601 and explores contemporary literature, theory, and intellectual issues in American Studies.
Restriction: Must be in one of the following programs (American Studies (Master's); American Studies (Doctoral)) . Or permission of ARHU-American Studies department; and permission of instructor.

AMST628 Seminar in American Studies (3 Credits)

AMST629 Seminar in American Studies (3 Credits)

AMST638 Orientation Seminar: Material Aspects of American Civilization (3 Credits)
Class meets at the Smithsonian.

AMST639 Reading Course in Selected Aspects of American Civilization (3 Credits)
Class meets at the Smithsonian.

AMST650 Material Culture Studies Theory (3 Credits)
Readings and analysis of canonical and current scholarly approaches to the study of material culture. Covers a wide range of material culture genres and subfields, and focuses on artifacts and the built environment.

AMST655 Introduction to Museum Scholarship (3 Credits)
Provides students a basic understanding of museums as cultural and intellectual institutions. Topics include the historical development of museums, museums as resources for scholarly study, and the museum exhibition as medium for presentation of scholarship.
Cross-listed with: ANTH655, HIST610, INST653.
Credit Only Granted for: AMST655, ANTH655, HIST610, INST728T or INST653.

AMST659 Special Topics: Collaborative Curation (3 Credits)
This seminar considers the history of curation and curators within the institutional setting of museums and offers participants the opportunity, and challenge, to engage in curatorial practice by planning an exhibition that focuses on a critical aspect of life at and around the University of Maryland over the years.
Prerequisite: AMST655, ANTH655 or HIST610.
Recommended: AMST856, ANTH856, or HIST810; and AMST857, ANTH857 or HIST811.
Cross-listed with: ANTH659, HIST688, INST788.
Restriction: Must have permission of the Museum Studies and Material Culture program.
Repeatable to: 6 credits if content differs.
Additional Information: Students enrolled in the MSMC (Museum Studies and Material Culture) certificate program will be given priority for enrollment.

AMST698 Directed Readings in American Studies (3 Credits)
This course is designed to provide students with the opportunity to pursue independent, interdisciplinary research and reading in specific aspects of American culture under the supervision of a faculty member.
Repeatable to: 6 credits if content differs.

AMST789 Professional Development in Dance and Theatre (1 Credit)
This course will introduce graduate students to the academic job market, competitive fellowships, and ALT-AC (alternative academic) careers. Topics will include the interdisciplinary job market, cover letters, cv's, teaching and research statements, the teaching/artist portfolio, the diversity statement, interfolio, letters of recommendation, writing samples, websites, interviewing, and careers beyond academia.
Cross-listed with: TDPS789.
Repeatable to: 4 credits.
Formerly: THET669K, DANC689F.

AMST798 Non-Thesis Research (1-3 Credits)

AMST799 Master's Thesis Research (1-6 Credits)

AMST856 Museum Research Seminar (3 Credits)
A research seminar focusing on the practice and presentation of cultural and historical scholarship in museums and historical sites. Students will complete an original research project on the challenges and opportunities of public exhibition and interpretation of cultural and historical research.
Prerequisite: AMST655, ANTH655, or HIST610.
Cross-listed with: ANTH856, HIST810, INST786.
Credit Only Granted for: AMST856, ANTH856, HIST810, INST728U or INST786.

AMST857 Museum Scholarship Practicum (3-6 Credits)
Students devise and carry out a research program using the collections at the Smithsonian Institution or some other cooperating museum, working under joint supervision of a museum professional and a university faculty member.
Prerequisite: AMST856, ANTH856, or HIST810.
Cross-listed with: ANTH857, HIST811, INST787.
Restriction: Permission of Museum Scholarship Program required.
Credit Only Granted for: AMST857, ANTH857, HIST811, INST728I or INST787.

AMST878 American Studies Pedagogy Mentoring (1-3 Credits)
This course provides graduate teaching assistants with a structured approach to pedagogical content, techniques, and collaborative practices that they learn and then can use throughout their careers. It also commits a core faculty member to teaching pedagogy and makes it possible for the course to become a formal part of one's load.
Restriction: Must be an AMST graduate assistant.
Repeatable to: 12 credits.

AMST898 Pre-Candidacy Research (1-8 Credits)

AMST899 Doctoral Dissertation Research (1-8 Credits)

ANSC - Animal Science

ANSC401 Animal Growth and Development for Production Agriculture (3 Credits)
An integration of the physiological, genetic, and nutritional bases of animal growth, development, and body composition with application to livestock production.
Prerequisite: ANSC201.

ANSC410 The Gut Microbiome and its Roles in Health and Disease (3 Credits)
A comprehensive study of the gut microbiome and its role in nutrition, metabolism, immunity, and disease prevention, with applications to farm animal health, food value, and human gastrointestinal health.
Prerequisite: 1 course from (BSCI223, ANSC201, ANSC212, ANSC327, EPIB301, BSCI222, BSCI421, NFSC430); or students who have taken courses with comparable content may contact the department.

ANSC417 Regulatory Issues in Animal Care and Management (3 Credits)
A study of regulatory issues affecting animal care and management in the livestock industry. Guest speakers and classroom discussions will focus on key topics including animal welfare, feed and drug regulations, animal identification, CAFO management, processing and marketing of animal products.
Prerequisite: ANSC220, ANSC232, ANSC242, ANSC250, ANSC255, ANSC260, ANSC262, or ANSC282; or permission of instructor.
Additional Information: Field trips may be required for this course.

ANSC435 Experimental Embryology (3 Credits)
Experimental approaches in animal embryology with emphasis on domestic livestock systems as applied to research and production systems. Lab will include hands-on experiments and demonstrations of techniques that are commonly used in industry and research.
Prerequisite: ANSC212 or ANSC201.
Recommended: ANSC446.
Credit Only Granted for: ANSC435 or ANSC489M.
Formerly: ANSC489M.

ANSC436 Animal Health Policy and Communication (3 Credits)
Intended for upper level students in Veterinary Medicine or Animal Science as well as other students who are interested in understanding how science and politics interact and influence animal health policy and how veterinarians and animal scientists can effectively communicate science to non-scientists such as legislators and policymakers.
Recommended: Completion of ANSC225 and ANSC340 recommend.
Cross-listed with: VMSC436.
Restriction: Must be in a major within the AGNR-Animal & Avian Sciences department; or permission of AGNR-VA-MD Regional COL Veterinary Med.
Credit Only Granted for: ANSC489A, ANSC436, or VMSC436.
Formerly: ANSC489A.

ANSC437 Animal Biotechnology (3 Credits)
Key concepts and current issues in animal biotechnology are covered. Current techniques and applications systems as well as social, ethical, and regulatory issues associated with biotechnology will be discussed.
Prerequisite: ANSC327; or students who have taken courses with comparable content may contact the department.

ANSC440 Zoonotic Diseases and Control (3 Credits)
Examines zoonotic diseases of importance in the United States and worldwide, with an emphasis on those originating from farm animals as well as those transmitted by vectors such as rodents and arthropods. Topics include major foodborne and vector-borne zoonoses, principles of transmission and control, human risk factors, and surveillance methods. Students will also explore the historical and emerging significance of zoonotic diseases, approaches to vector management, alternatives to pesticide use, and relevant regulations and safety measures.
Prerequisite: 1 course from (BSCI223, ANSC201, ANSC212, ANSC327, BSCI222, BSCI421, NFSC430); or students who have taken courses with comparable content may contact the department.

ANSC443 Physiology of Lactation (3 Credits)
A comprehensive survey of lactation in laboratory and domestic animals. Other species are discussed where possible. Emphasis will be placed on physiological aspects of milk synthesis and secretion and on the cellular and molecular biology of mammary gland development.
Prerequisite: ANSC212; and (CHEM231, PLSC275 or AGST275).
Recommended: BCHM463.

ANSC444 Domestic Animal Endocrinology (3 Credits)
A comprehensive course covering the major endocrine systems in domestic animals. Topics include each of the major endocrine axes, hormonal regulation of homeostasis, growth and reproduction, molecular endocrinology and endocrine mechanisms of action.
Prerequisite: ANSC212 or ANSC201.
Restriction: Must not have completed ANSC644.
Credit Only Granted for: ANSC444 or ANSC644.

ANSC445 Comparative Gut Physiology & Diseases (3 Credits)
Explores the anatomy, histology, and physiology of the gastrointestinal (GI) system in humans and animals, including dogs, pigs, horses, cattle, and birds. Students will study how gut function supports health and development, and how it becomes disrupted in common and emerging diseases. The course also explores the gut's functions beyond the GI tract, including its roles in the gut-liver and gut-brain axes, while reviewing important research on gastrointestinal disorders. It prepares students for careers in veterinary and human medicine, industry, and scientific research.
Prerequisite: ANSC212 or ANSC201.

ANSC446 Physiology of Mammalian Reproduction (3 Credits)
Provides an in-depth examination of reproductive anatomy and physiology in domesticated livestock species, emphasizing the biological mechanisms and management strategies that influence reproductive efficiency. Students will explore the endocrine regulation of reproduction, assisted reproductive technologies, and factors affecting fertility, pregnancy, parturition, and lactation. The course integrates scientific principles with practical applications in animal agriculture, preparing students to evaluate and apply reproductive management techniques in livestock production systems.
Prerequisite: ANSC212, ANSC201 or BSCI440.

ANSC447 Physiology of Mammalian Reproduction Laboratory (1 Credit)
Gross and micro-anatomy, artificial insemination, estrous cycle synchronization and invitro-fertilization procedures and analytical techniques useful in animal management and reproduction.
Prerequisite: Must have completed or be concurrently enrolled in ANSC446.

ANSC450 Animal Breeding Plans (3 Credits)
Design of animal breeding programs for the genetic improvement of livestock and companion animal species. Principles of population and quantitative genetics. Genetic evaluations of animals, selection strategies and crossbreeding systems. Incorporation of statistics and biotechnology into animal breeding plans.
Prerequisite: ANSC101; and 1 course with a minimum grade of C- from (MATH120, MATH136, MATH140, or BIOM301).
Restriction: Junior standing or higher.

ANSC452 Avian Physiology (3 Credits)
Provides a comparative study of avian and mammalian physiology, with emphasis on similarities and differences across systems. Students will analyze the reproductive, digestive, renal, respiratory, circulatory, immune, endocrine, and nervous systems of birds, as well as physiological adaptations unique to avian species such as flight and migration.
Prerequisite: ANSC201 or ANSC212.
Restriction: Junior standing or higher.

ANSC453 Animal Welfare and Bioethics (3 Credits)
Ethical concerns related to the use of animals in modern society. Historical and philosophical overview of animal welfare and bioethics. Applied ethical discussions on human/animal interrelationships, physical and genetic manipulation, and other current issues associated with the treatment of animals used in food production, research, zoos, and as pets.
Prerequisite: ANSC101 and ANSC103; or BSCI106; or (BSCI160 and BSCI161); or permission of instructor.
Restriction: Junior standing or higher.

ANSC454 Nutritional Aspects of Metabolic Disease (3 Credits)
Biochemical and physiological fundamentals of nutrition. Discussion of protein, fat,carbohydrate, minerals and vitamins and their roles and interrelationships innutrition, metabolism and diseases in humans and animals. The course will use recommended texts for foundation material as well as research papers to provide in-depth coverage and illustrate emerging themes in metabolic aspects of nutrition and disease.
Prerequisite: CHEM131 and ANSC101, or BSCI170; or students who have taken courses with comparable content may contact the department.
Credit Only Granted for: ANSC4890 or ANSC454.
Formerly: ANSC489O.

ANSC455 Applied Animal Behavior (3 Credits)
Principles of animal behavior applied to production systems in animal agriculture.
Prerequisite: ANSC101 and ANSC103; or BSCI106; or (BSCI160 and BSCI161).

ANSC460 Comparative Vertebrate Immunology (3 Credits)
Basic concepts in immunology, and comparing immunity in different vertebrates, including organization of immune systems, innate and adaptive immune responses. Special attention will be paid to how cell-mediated and humoral immune responses are induced in natural infections, and what are the effector mechanisms in both of these processes. Immune response in representative disease models such as infections with viruses and bacteria, cancer, and autoimmune disease will be discussed. Lectures concerning cutting-edge research will also be given.
Prerequisite: ANSC212, ANSC201, BSCI201, or BSCI440.

ANSC489 Current Topics in Animal Science (1-3 Credits)
Examination of current developments in the animal sciences.
Repeatable to: 6 credits if content differs.

ANSC497 Animal Biotechnology Recombinant DNA Laboratory (3 Credits)
An advanced course offering hands-on experience in performing recombinant DNA experiments. Current molecular biology techniques used for cloning genes, analyzing the gene products, and modifying the genes of animals will be performed. Techniques include isolation of DNA, use of restriction enzymes; cloning procedures, PCR analysis, and Southern hybridizations. Lecture material focuses on interpretation of results generated in the laboratory.
Prerequisite: ANSC327; or students who have taken courses with comparable content may contact the department.
Recommended: ANSC437 and ANSC435.

ANSC617 Quantative Techniques in Physiology and Nutrition (3 Credits)
Development and evaluation of quantative techniques to explore mechanisims of physiological and nutritional regulation. Kinetic and dynamic models will be emphasized.
Prerequisite: MATH120; or permission of AGNR-Animal & Avian Sciences department.

ANSC624 Recent Advances in Animal and Avian Sciences (1 Credit)
Seminar course in advanced animal science research.
Restriction: Must be an Animal Sciences graduate student.
Credit Only Granted for: ANSC698C or ANSC624.
Formerly: ANSC698C.

ANSC625 Developing Presentation Skills (1 Credit)
Seminar designed to teach oral presentation skills for animal science students.
Restriction: Must be an Animal Sciences graduate student.
Credit Only Granted for: ANSC625 or ANSC698D.
Formerly: ANSC698D.

ANSC627 Molecular and Quantitative Genetics (3 Credits)
Classical, molecular, and population genetics with specific emphasis on animal systems will be covered. Also, disseminate information on molecular approaches for manipulating genetics at the whole animal level (transgenic and cloning). Other model organisms will be discussed to provide a conceptual framework.

ANSC644 Molecular and Cellular Endocrinology (3 Credits)
A comprehensive course covering the major endocrine systems in animals. Lecture topics include major endocrine axes, hormonal regulation of homeostasis, growth and reproduction, and endocrine mechanisms of action. Advanced concepts in the molecular and cell biology of hormone action and regulation addressed in weekly discussion sessions centered on current research publications in the field of molecular and cellular endocrinology.
Restriction: Must not have completed ANSC444.
Credit Only Granted for: ANSC444,ANSC489I, ANSC644, or ANSC688I.
Formerly: ANSC688I.

ANSC660 Poultry Literature (1-4 Credits)
Readings on individual topics are assigned. Written reports required. Methods of analysis and presentation of scientific material are discussed.

ANSC688 Special Topics (1-4 Credits)
Lectures, experimental courses, and other special subjects in the fields of animal sciences and veterinary medicine.
Repeatable to: 4 credits.

ANSC698 Seminar (1 Credit)
Students are required to prepare papers based upon current scientific publications relating to animal science, or upon their research work, for presentation before and discussion by the class; (1) recent advances; (2) nutrition; (3) physiology; (4) biochemistry.

ANSC699 Special Problems in Animal Science (1-2 Credits)
Work assigned in proportion to amount of credit. Prerequisite: approval of staff. Problems will be assigned which relate specifically to the character of work the student is pursuing.

ANSC799 Master's Thesis Research (1-6 Credits)

ANSC898 Pre-Candidacy Research (1-8 Credits)

ANSC899 Doctoral Dissertation Research (1-8 Credits)

ANTH - Anthropology

ANTH403 Queer Anthropology (3 Credits)

ANTH407 Anthropology and Development (3 Credits)
An examination of the intersection of Anthropology, international development and foreign policy. The course provides students with conceptual tools to engage with international development and other assistance projects in areas including conservation and climate change, governance and human security, gender, human rights, and political stability from a variety of viewpoints.
Jointly offered with: ANTH607.
Credit Only Granted for: ANTH407 or ANTH607.

ANTH411 Global Migration and Health (3 Credits)
The United Nations estimates that some 230 million people around the world are migrants who live outside their country of birth. This course focuses on these migrant populations, considering the implications of movement across borders and settlement in new societies on their health and well-being. We will investigate the social, political, and economic structures that shape disease and illness and produce differential access to health care for migrants. Within that context, we will explore the health effects of migration itself and particular health conditions from which migrants suffer. We will also examine how migrants interface with differently configured health care systems as well as strategies they and their advocates use to promote health and well-being.
Jointly offered with: ANTH611.
Credit Only Granted for: ANTH411 or ANTH611.

ANTH412 Hypermarginality and Urban Health (3 Credits)
Using perspectives from medical and urban anthropology, we examine the phenomenon of hypermarginality--the clustering of extreme poverty, chronic disease, addiction, violence and trauma in certain social and spatial contexts, often urban. We will explore both the broader social, political, and economic structures of exclusion that produce hypermarginality, as well as the illness experiences associated with these conditions. As we consider both social suffering and the related institutional responses, we will also discuss the role of anthropological approaches in national discussions about health inequities.
Credit Only Granted for: ANTH412 or ANTH612.

ANTH413 Health Inequities, Care, and Justice in the United States (3 Credits)
Systematic health inequities in the United States are well documented, shaped by structural forces that determine who gets sick, what illnesses/diseases they are vulnerable to, what their care options are, how they are treated while seeking care, and their ultimate health outcomes. This course applies the concepts, methods, and theoretical approaches of medical anthropology to examine the roots and implications of these health inequities. Students will also assess efforts to address these inequities through tailored interventions and social movements organized around equity and justice.
Jointly offered with: ANTH613.
Credit Only Granted for: ANTH413 or ANTH613.

ANTH415 Critical Global Health (3 Credits)
Extends understandings of diverse health conditions facing world populations today and the science being made around them. Critically examines key issues in global aid and public health, with an emphasis on the theories, concepts, and methods of anthropology.
Recommended: ANTH210, ANTH310, or ANTH265 or a similar course focused on global health or medical anthropology course.
Jointly offered with: ANTH615.
Credit Only Granted for: ANTH415 or ANTH615.

ANTH416 Anthropology of Global Violence (3 Credits)
An examination of anthropological approaches to the study of violence, drawing from key texts to analyze how violence operates along a continuum: from routine, sometimes invisible forms of violence embedded in everyday life, to more overt and exceptional forms. Consideration of the role of ethnography in elucidating both the subjective experiences of violence and the ways in which violence is embedded in institutions, structures, and global political-economic processes. Analysis of the specific relationships between violence, health, mental health, and trauma in local and global contexts.Jointly offered with ANTH616.
Credit Only Granted for: ANTH468O, ANTH66 8O, ANTH416 or ANTH616.
Formerly: ANTH468O.

ANTH421 Nutritional Anthropology (3 Credits)
The study of nutrition from an anthropological perspective which includes both biological and cultural aspects of nutrition. We will explore how nutrition can affect culture how culture can affect nutrition. Nutritional anthropology includes the study of cross-cultural variation in diet, nutritional status and subsistence systems as well as variation in these factors over the evolutionary course of human existence, from prehistoric and historic to modem times. Students will be introduced to nutritional anthropology and provided with the basics for assessing reliability and feasibility of nutritional advice and policy encountered in everyday modern life in a global setting.
Credit Only Granted for: ANTH421, ANTH428N, or ANTH621.
Formerly: ANTH428N.

ANTH424 Human Skeletal Anatomy (3 Credits)
In addition to descriptive information about bone identification, the lectures will address the history of human anatomical studies, the development of analytical techniques, and the application of these techniques in paleoanthropology, comparative anatomy, functional anatomy (and related fields, such as physical therapy), and skeletal analysis in museum, historic cemetery, archaeological, and forensic settings. Emphasis will be on the development of the skeleton and recognition of normal variation in bones. The laboratory sessions will allow the students access to human bones for the purpose of identification, documentation of human variation, and application of techniques to obtain information about the living individual from the skeleton.

ANTH428 Special Topics in Bioanthropology (3 Credits)
Advanced research courses in biological anthropology on changing topics that correspond to new theoretical interests, faculty research interests, or the specialties of visiting scholars. Prerequisites or background knowledge vary with the topic. Check with the department for requirements.
Repeatable to: 6 credits if content differs.

ANTH429 Advanced Special Topics in Biological Anthropology (3 Credits)
Upper level biological anthropology courses on varying topics derived from new interests of the faculty or the specialties of visiting scholars.
Repeatable to: 6 credits if content differs.

ANTH433 Archaeology of Slavery: Classical, Caribbean and North American Contexts (3 Credits)
Has slavery always existed? Does it come and go? North American plantation archaeology has become one of the foundations for understanding African American culture from the 1960s. Slavery in Antiquity existed in Greece and Rome on large scales and was essential to making commercial agriculture profitable work. Slavery in the Caribbean showed Europeans how to make a profit from African bodies. Trafficking in human persons today is recorded by the U.S. State Department annually and is regarded as modern slavery. These varying contexts of slavery will be compared in an attempt to understand slavery scientifically.
Jointly offered with: ANTH633.
Credit Only Granted for: ANTH433 or ANTH633.

ANTH435 Archaeological Ethnography and Heritage Ethnography (3 Credits)
Archaeologists and other heritage experts are increasingly incorporating ethnographic approaches as part of their methodological toolkit. This course explores key methods and frameworks in archaeological ethnography and heritage ethnography, set within the broader contexts of the historical development of anthropological theory and the current rapid growth of heritage studies as an interdisciplinary field of research and practice.
Jointly offered with: ANTH635.
Credit Only Granted for: ANTH435 or ANTH635.

ANTH436 Norse Archaeology (3 Credits)
The archaeology of the Norse world from the 8th century through to the end of the 11th century. We will investigate the possible causes of the Norse expansion out of Scandinavia. The various settlements and colonies of Norse Russia, the Baltic, Britain, Ireland and the North Atlantic Islands (Orkney, the Shetlands, the Faroes, Iceland, Greenland and Newfoundland) will be examined. While we will look at the Norse in detail we will also attempt to put their raiding, trading, and settlements into a larger Eurasian context through a study of the archaeology of this period.
Credit Only Granted for: ANTH436 or ANTH636.

ANTH438 Special Topics in Study Abroad IV (1-6 Credits)
Special topics course taken as part of an approved study abroad program.
Repeatable to: 15 credits if content differs.

ANTH440 Theory and Practice of Historical Archaeology (3 Credits)
Historical archaeology enhances cultural heritage by providing voice for groups who were often unable to record their own histories, such as women, laborers, working class families, and enslaved people. The course provides insight into issues related to race, gender, and ethnicity as they relate to multicultural histories.
Prerequisite: ANTH240. Jointly offered with ANTH640.
Credit Only Granted for: ANTH440 or ANTH640.

ANTH441 Archaeology of Diaspora (3 Credits)
"Diaspora" is defined, theorized, deconstructed, and employed throughout the social sciences. There are context specific relations that define who leaves, when, and how they are received in the new place of settlement. Over the course of the semester the class will actively and critically examine the relevance of historical archaeology and material culture studies in the understanding of the formation, experiences, and transformation of diasporic groups over time and space.
Prerequisite: ANTH240.
Credit Only Granted for: ANTH448A, ANTH688Z, or ANTH441.
Formerly: ANTH448A.

ANTH445 Laboratory Methods in Archaeology (3 Credits)
The processing, curation, cataloging and analysis of data is an important part of any archaeology field project. Students will learn that basics of laboratory techniques necessary for the final analysis and interpretation of field data.
Prerequisite: ANTH496.
Recommended: ANTH240.

ANTH447 Material Culture Studies in Archaeology (3 Credits)
An in-depth introduction to the world of material culture studies with a focus on the methods and theories in historical archaeology. Students will look at archaeological data as historical documents, commodities and as symbols expressing ideas.
Prerequisite: ANTH240.
Credit Only Granted for: ANTH447, ANTH448C, ANTH647, or ANTH689C.
Formerly: ANTH448C.

ANTH448 Special Topics in Archaeology (3 Credits)
Advanced topics in archaeological research, corresponding to new theoretical developments, faculty research interests, or specialties of visiting scholars. Prerequisites may vary with course topic; check with the department for requirements.
Prerequisite: ANTH240.
Repeatable to: 6 credits if content differs.

ANTH449 Advanced Special Topics in Archaeology (3 Credits)
Upper level archaeology courses on varying topics derived from new interests of the faculty or the specialties of visiting scholars.
Repeatable to: 6 credits if content differs.

ANTH450 Theory and Practice of Environmental Anthropology (3 Credits)
An overview of contemporary application of cultural theory and methods to environmental problems. Topics include the use of theories of culture, cognitive approaches, discourse analysis, and political ecology. Case studies from anthropology, other social sciences, humanities, conservation, and environmental history are used to demonstrate the applied value of a cultural-environmental approach.
Restriction: Junior standing or higher. Jointly offered with ANTH650.
Credit Only Granted for: ANTH450 or ANTH650.

ANTH451 Environmental Archaeology (3 Credits)
An overview of modern environmental archaeology as a tool for the interdisciplinary investigation of past and present global change and to engage the long term past with current issues of sustainability and rapid environmental change.
Credit Only Granted for: ANTH451, ANTH651, ANTH448F, ANTH668F.
Formerly: ANTH448F.

ANTH452 Anthropology and Climate Change (3 Credits)
Human activities now influence ongoing global climatic change, and the outcome remains uncertain for communities and cultures around the world. This interaction between humans and climate provides a rich area of study for anthropologists in an interdisciplinary context. Case studies of historic and contemporary evidence will be used to understand impacts of global climate change and assess opportunities and barriers to successful responses and adaptation.
Prerequisite: ANTH220, ANTH222, ANTH240, or ANTH260.
Credit Only Granted for: ANTH452 or ANTH652.

ANTH453 Archaeology of the Modern City (3 Credits)
An overview of how social scientists, in particular historical archaeologists, approach modern cities as being part of the materiality of the social structure and order.
Prerequisite: ANTH240; or permission of instructor.
Credit Only Granted for: ANTH448Q or ANTH453.
Formerly: ANTH448Q.

ANTH454 Political Ecology (3 Credits)
The use of the environment is contested and negotiated within historic and contemporary societies. Incorporating methods and perspectives from across the social sciences through specific case studies in the Americas, Europe, Asia and Africa, this course offers a survey to coupled human-environmental systems.
Jointly offered with: ANTH654.
Credit Only Granted for: ANTH454 or ANTH654.

ANTH461 Language as Practice (3 Credits)
An introduction to linguistic variation and the construction of identity, relationship, and community membership through language use. The approach emphasizes language as community-based practice and examines the dynamic construction of social relations through linguistic interactions.
Jointly offered with: ANTH661.
Credit Only Granted for: ANTH461, ANTH468I or ANTH661.
Formerly: ANTH468I.

ANTH463 Climate Cultures (3 Credits)
Climate change is an inherently global problem. To a significant degree, its causes and consequences are cultural in nature: Climate change impacts, mitigation and adaptation efforts are perceived and addressed in culture-specific ways. This course will be an overview of the holistic and anthropological approaches to the study of how culture frames what we know and how we respond to climate change. Readings, lectures, and discussions will focus on how culture is expressed through the interplay of processes and practices in specific economic, social and political contexts.

ANTH464 Anthropology of Cultural Heritage (3 Credits)
A global exploration of how the past is remade in the present. Covers the breadth of scope and specific interventions of heritage practice at the global scale, including the social, political, economic, and ethical dimensions of cultural heritage.
Prerequisite: ANTH260. Jointly offered with ANTH664. Credit only grant ed for: ANTH469T, ANTH689T, ANTH464, ANTH664.
Formerly: ANTH469T.

ANTH465 Applied Ethnoecology (3 Credits)
Introduces theory and methodology for applied ethnoecology, the study of human relationships with and knowledge about the environment. Students will examine human relationships with both biotic (e.g. plants and animals) and abiotic (e.g. glaciers, weather) elements of ecological systems to better understand how knowledge frameworks and cultural practices shape human experiences of the natural world. The history of ethnoecology as a discipline will be covered, before moving to applied case studies where different ecological knowledge systems intersect as a result of conservation projects, bioprospecting, and other contemporary environmental issues. This course involves both discussion and project-based learning including StoryMaps, cultural domain analysis and text analysis.
Credit Only Granted for: ANTH465 or ANTH688E.

ANTH466 Anthropology of Work (3 Credits)
Examines the concept and meaning of work, the different types of work, and how the development of time discipline became essential for the creation of capitalist labor. Explores the contemporary social justice movement and its impact on gender and racialized inequities. Includes an exploration of deindustrialized regions in the Rust Belt.
Jointly offered with: ANTH666.
Credit Only Granted for: ANTH466 or ANTH666.

ANTH467 Researching Environment and Culture (3 Credits)
In this applied course, students use mixed methods to research a locally-based, environmental sustainability issue. Classroom time will be split between seminar discussions of theory, methods, and relevant case studies, and lab work focused on project development, data analysis, and report write up. Students are expected to spend additional time outside class on data collection, analysis, and writing
Recommended: ANTH322, ANTH360, ENSP101, or ENSP102.

ANTH468 Special Topics in Cultural Anthropology (3 Credits)
Advanced courses in varying specialty areas of cultural anthropology that respond to new theoretical developments, faculty research interests, or specialties of visiting scholars.
Repeatable to: 6 credits if content differs.

ANTH469 Advanced Special Topics in Cultural Anthropology (3 Credits)
Upper level cultural anthropology courses on varying topics derived from new interests of the faculty or the specialties of visiting scholars.
Repeatable to: 6 credits if content differs.

ANTH473 Native American Languages and Cultures (3 Credits)
An introduction to Native American Languages and Cultures from a linguistic anthropological perspective. Topics to be explored include Native American identities, the stucture of Native languages, oral traditions, narrative story-telling, Native language and thought (Sapir/Whorf), language shift, linguistic revitalization, documentation of endangered languages, indigenous representation and appropriation, and racializing discourses.
Jointly offered with: ANTH673.
Credit Only Granted for: ANTH473 or ANTH673.

ANTH474 Language Racism & Identity (3 Credits)
An exploration of the relationship between language, identity and racism in a variety of social contexts, in the U.S. and elsewhere.
Jointly offered with: ANTH674.
Credit Only Granted for: ANTH474, ANTH469R, ANTH674, or ANTH689R.

ANTH478 Special Topics in Linguistics (3 Credits)
Advanced courses in specialty areas that respond to new theoretical developments and faculty research interests in linguistics.
Recommended: LING200.
Repeatable to: 6 credits if content differs.

ANTH481 Environmental Ethnographies of Asia (3 Credits)
Examines social and ecological environments in Asia through the lens of classic and contemporary ethnographies from across the continent. Considers how cultural, political and economic dynamics interact with ecological systems in both recurring and unexpected ways. Ethnographies include case studies of global commodity chains, technoscientific management, borders and migration, conservation, and local knowledge as they intersect with changing environments.
Credit Only Granted for: ANTH481 or ANTH681.

ANTH485 Honors Research Preparation (3 Credits)
Honors Research Preparation is an independent study course during which the Honors candidate will work with their Honors Thesis Advisor to establish not only the structure of the thesis and timeline, but also the formation of Thesis Review Committee.
Restriction: Permission of BSOS-Anthropology department; and must be in Anthropology program; and must be admitted to University Honors Program or Anthropology Honors Program.

ANTH486 Honors Research (3-4 Credits)
Capstone course in which students pursue independent research into a current problem in anthropology, selected with assistance of a committee of faculty. Research leads to the writing of an honors thesis in anthropology.
Restriction: Permission of BSOS-Anthropology department; and must be in Anthropology program; and must be admitted to University Honors Program or Anthropology Honors Program.
Credit Only Granted for: ANTH486 or ANTH476.

ANTH487 Honors Thesis (3-4 Credits)
Capstone course in which students write a thesis on the results of independent research into a current problem in anthropology.
Prerequisite: ANTH486.
Restriction: Permission of BSOS-Anthropology department; and must be in Anthropology program; and must be admitted to University Honors Program or Anthropology Honors Program.
Credit Only Granted for: ANTH487 or ANTH477.

ANTH496 Field Methods in Archaeology (6 Credits)
Field training in the techniques of archaeological survey and excavation.

ANTH498 Advanced Field Training in Ethnography (1-8 Credits)
Experience in field research utilizing a variety of ethnographic methods of inquiry.
Repeatable to: 6 credits if content differs.
Credit Only Granted for: ANTH498 or ANTH698.

ANTH601 Applied Anthropology (3 Credits)
An overview of the history and current practices of applied anthropology. This includes relationships between applied anthropology and other major subfields of the profession; the interdisciplinary and public context of applied anthropology; and problems of significance, utility, and ethics associated with applied anthropology.

ANTH606 Qualitative Methods in Applied Anthropology (3 Credits)
An introduction to the use of ethnography and qualitative methods in applied and policy contexts. Qualitative methods discussed include informal and systematic approaches. Students undertake fieldwork in local settings to practice the qualitative methods and to develop analysis and report writing skills.

ANTH607 Anthropology and Development (3 Credits)
An examination of the intersection of Anthropology, international development and foreign policy. The course provides students with conceptual tools to engage with international development and other assistance projects in areas including conservation and climate change, governance and human security, gender, human rights, and political stability from a variety of viewpoints.
Jointly offered with: ANTH407.
Credit Only Granted for: ANTH407 or ANTH607.

ANTH611 Global Migration and Health (3 Credits)
The United Nations estimates that some 230 million people around the world are migrants who live outside their country of birth. This course focuses on these migrant populations, considering the implications of movement across borders and settlement in new societies on their health and well-being. We will investigate the social, political, and economic structures that shape disease and illness and produce differential access to health care for migrants. Within that context, we will explore the health effects of migration itself and particular health conditions from which migrants suffer. We will also examine how migrants interface with differently configured health care systems as well as strategies they and their advocates use to promote health and well-being.
Jointly offered with: ANTH411.
Credit Only Granted for: ANTH411 or ANTH611.

ANTH612 Hypermarginality and Urban Health (3 Credits)
Using perspectives from medical and urban anthropology, we examine the phenomenon of hypermarginality--the clustering of extreme poverty, chronic disease, addiction, violence and trauma in certain social and spatial contexts, often urban. We will explore both the broader social, political, and economic structures of exclusion that produce hypermarginality, as well as the illness experiences associated with these conditions. As we consider both social suffering and the related institutional responses, we will also discuss the role of anthropological approaches in national discussions about health inequities.Jointly offered with ANTH412.
Credit Only Granted for: ANTH412 or ANTH612.

ANTH613 Health Inequities, Care, and Justice in the United States (3 Credits)
Systematic health inequities in the United States are well documented, shaped by structural forces that determine who gets sick, what illnesses/diseases they are vulnerable to, what their care options are, how they are treated while seeking care, and their ultimate health outcomes. This course applies the concepts, methods, and theoretical approaches of medical anthropology to examine the roots and implications of these health inequities. Students will also assess efforts to address these inequities through tailored interventions and social movements organized around equity and justice.
Jointly offered with: ANTH413.
Credit Only Granted for: ANTH413 or ANTH613.

ANTH615 Critical Global Health (3 Credits)
Extends understandings of diverse health conditions facing world populations today and the science being made around them. Critically examines key issues in global aid and public health, with an emphasis on the theories, concepts, and methods of anthropology.
Jointly offered with: ANTH415.
Credit Only Granted for: ANTH415 or ANTH615.

ANTH616 Anthropology of Global Violence (3 Credits)
An examination of anthropological approaches to the study of violence, drawing from key texts to analyze how violence operates along a continuum: from routine, sometimes invisible forms of violence embedded in everyday life, to more overt and exceptional forms. Consideration of the role of ethnography in elucidating both the subjective experiences of violence and the ways in which violence is embedded in institutions, structures, and global political-economic processes. Analysis of the specific relationships between violence, health, mental health, and trauma in local and global contexts.
Credit Only Granted for: ANTH416 or ANTH616.

ANTH620 Environment and Society (3 Credits)
Students will obtain foundational knowledge of core theories and methods that integrate cultural and socio-economic research into environmental science. Key topics include: coupled natural and human systems, cultural models of the environment, social networks, ecological economics, political ecology, environmental justice, and science communication.
Cross-listed with: MEES620.
Credit Only Granted for: ANTH620 or MEES620.
Additional Information: Offered over the interactive video network.

ANTH629 Advanced Developments in Biological Anthropology (3 Credits)
Graduate biological anthropology courses on varying topics derived from new interests of the faculty or the specialties of visiting scholars.
Restriction: Permission of BSOS-Anthropology department.
Credit Only Granted for: ANTH429 or ANTH629.

ANTH630 Quantification and Statistics in Applied Anthropology (3 Credits)
An intensive overview of key quantitative and statistical approaches used by social scientists in applied ad policy research. This includes nonparametric and parametric statistical approaches. Students utilize statistical software and analyze existing and student-created databases. Anthropological case studies are emphasized.
Restriction: Must be in one of the following programs (Anthropology (Doctoral); Anthropology (Master's)).

ANTH633 Archaeology of Slavery: Classical, Caribbean and North American Contexts (3 Credits)
Has slavery always existed? Does it come and go? North American plantation archaeology has become one of the foundations for understanding African American culture from the 1960s. Slavery in Antiquity existed in Greece and Rome on large scales and was essential to making commercial agriculture profitable work. Slavery in the Caribbean showed Europeans how to make a profit from African bodies. Trafficking in human persons today is recorded by the U.S. State Department annually and is regarded as modern slavery. These varying contexts of slavery will be compared in an attempt to understand slavery scientifically.
Jointly offered with: ANTH433.
Credit Only Granted for: ANTH433 or ANTH633.

ANTH635 Archaeological Ethnography and Heritage Ethnography (3 Credits)
Archaeologists and other heritage experts are increasingly incorporating ethnographic approaches as part of their methodological toolkit. This course explores key methods and frameworks in archaeological ethnography and heritage ethnography, set within the broader contexts of the historical development of anthropological theory and the current rapid growth of heritage studies as an interdisciplinary field of research and practice.
Jointly offered with: ANTH435.
Credit Only Granted for: ANTH435 or ANTH635.

ANTH636 Norse Archaeology (3 Credits)
The archaeology of the Norse world from the 8th century through to the end of the 11th century. We will investigate the possible causes of the Norse expansion out of Scandinavia. The various settlements and colonies of Norse Russia, the Baltic, Britain, Ireland and the North Atlantic Islands (Orkney, the Shetlands, the Faroes, Iceland, Greenland and Newfoundland) will be examined. While we will look at the Norse in detail we will also attempt to put their raiding, trading, and settlements into a larger Eurasian context through a study of the archaeology of this period.
Credit Only Granted for: ANTH436 or ANTH636.

ANTH640 Advanced Studies in Theory and Practice of Historical Archaeology (3 Credits)
Historical archaeology enhances cultural heritage by providing voice for groups who were often unable to record their own histories, such as women, laborers, working class families, and enslaved people. The course provides insight into issues related to race, gender, and ethnicity as they relate to multicultural histories.Jointly offered with ANTH440.
Credit Only Granted for: ANTH440 or ANTH6 40.

ANTH641 Introduction to Zooarchaeology (3 Credits)
Zooarchaeology is the study of animal remains, especially bones, from archaeological contexts. This course will address both methodology as well as many of the main issues in contemporary zooarchaeology. Zooarchaeology stands at the intersection of a number of social and biological sciences, such as Biology, Osteology, Ecology, History, Anthropology and Economics. We will discuss basic animal osteology and the concepts and practices behind the identification of animal remains from archaeological contexts. We will cover the nature of the data in zooarchaeology, especially issues around using proxy data.Jointly offered with ANTH341.
Credit Only Granted for: ANTH298D, ANTH34 1 or ANTH641.

ANTH647 Advanced Material Culture Studies in Archaeology (3 Credits)
An in-depth introduction to the world of material culture studies with a focus on the methods and theories in historical archaeology. Students will look at archaeological data as historical documents, commodities and as symbols expressing ideas.
Credit Only Granted for: ANTH447, ANTH448C, ANTH647, or ANTH689C.
Formerly: ANTH689C.

ANTH649 Advanced Developments in Archaeology (3 Credits)
Graduate Archaeology courses on varying topics derived from new interests of the faculty or the specialties of visiting scholars.
Restriction: Permission of BSOS-Anthropology department.
Repeatable to: 6 credits if content differs.

ANTH650 Advanced Studies in Theory and Practice of Environmental Anthropology (3 Credits)
An overview of contemporary application of cultural theory and methods to environmental problems. Topics include the use of theories of culture, cognitive approaches, discourse analysis, and political ecology. Case studies from anthropology, other social sciences, humanities, conservation, and environmental history are used to demonstrate the applied value of a cultural-environmental approach.Jointly offered with ANTH450.
Credit Only Granted for: ANTH450 or ANTH6 50.

ANTH651 Environmental Archaeology (3 Credits)
An overview of modern environmental archaeology as a tool for the interdisciplinary investigation of past and present global change and to engage the long term past with current issues of sustainability and rapid environmental change.
Credit Only Granted for: ANTH448F, ANTH451, ANTH688F, or ANTH651.
Formerly: ANTH688F.

ANTH652 Anthropology and Climate Change (3 Credits)
Human activities now influence ongoing global climatic change, and the outcome remains uncertain for communities and cultures around the world. This interaction between humans and climate provides a rich area of study for anthropologists in an interdisciplinary context. Case studies of historic and contemporary evidence will be used to understand impacts of global climate change and assess opportunities and barriers to successful responses and adaptation.Jointly offered with ANTH452.
Credit Only Granted for: ANTH452 or ANTH6 52.

ANTH654 Political Ecology (3 Credits)
The use of the environment is contested and negotiated within historic and contemporary societies. Incorporating methods and perspectives from across the social sciences through specific case studies in the Americas, Europe, Asia and Africa, this course offers a survey to coupled human-environmental systems.
Jointly offered with: ANTH454.
Credit Only Granted for: ANTH454 or ANTH654.

ANTH655 Introduction to Museum Scholarship (3 Credits)
Provides students a basic understanding of museums as cultural and intellectual institutions. Topics include the historical development of museums, museums as resources for scholarly study, and the museum exhibition as medium for presentation of scholarship.
Cross-listed with: AMST655, HIST610, INST653.
Credit Only Granted for: AMST655, ANTH655, HIST610, INST728T or INST653.

ANTH657 Approaches to Sustainable Development (3 Credits)
An overview of the history of sustainable development, major development and environmental theories, and development strategies as they relate to an anthropological concern for an integrated, holistic, comparative, and humane approach to sustainable development.
Jointly offered with: ANTH357.
Credit Only Granted for: ANTH657 or ANTH357.

ANTH659 Special Topics: Collaborative Curation (3 Credits)
This seminar considers the history of curation and curators within the institutional setting of museums and offers participants the opportunity, and challenge, to engage in curatorial practice by planning an exhibition that focuses on a critical aspect of life at and around the University of Maryland over the years.
Prerequisite: AMST655, ANTH655 or HIST610.
Recommended: AMST856, ANTH856, or HIST810; and AMST857, ANTH857 or HIST811.
Cross-listed with: AMST659, HIST688, INST788.
Restriction: Must have permission of the Museum Studies and Material Culture program.
Repeatable to: 6 credits if content differs.
Additional Information: Students enrolled in the MSMC (Museum Studies and Material Culture) certificate program will be given priority for enrollment.

ANTH661 Language as Practice (3 Credits)
An introduction to linguistic variation and the construction of identity, relationship, and community membership through language use. The approach emphasizes language as community-based practice and examines the dynamic construction of social relations through linguistic interactions.
Jointly offered with: ANTH461.
Credit Only Granted for: ANTH468I, ANTH461, or ANTH661.

ANTH663 Climate Cultures (3 Credits)
Climate change is an inherently global problem. To a significant degree, its causes and consequences are cultural in nature: Climate change impacts, mitigation and adaptation efforts are perceived and addressed in culture-specific ways. This course will be an overview of the holistic and anthropological approaches to the study of how culture frames what we know and how we respond to climate change. Readings,lectures, and discussions will focus on how culture is expressed through the interplay of processes and practices in specific economic, social and political contexts.
Jointly offered with: ANTH463.
Credit Only Granted for: ANTH463 or ANTH663.

ANTH664 Anthropology of Cultural Heritage (3 Credits)
A global exploration of how the past is remade in the present. Covers the breadth of scope and specific interventions of heritage practice at the global scale, including the social, political, economic, and ethical dimensions of cultural heritage.
Credit Only Granted for: ANTH469T, ANTH689T, ANTH464 or ANTH664.
Formerly: ANTH689T.

ANTH665 Method & Theory in Medical Anthropology and Global Health (3 Credits)
Provides a critical perspective to global health that encompasses key political, economic, and cultural factors associated with the nature and magnitude of global health issues such as HIV/AIDS, tuberculosis and malaria, paying particular attention to how poverty and inequalities within and between societies has accelerated current global health challenges. Introduces students to how medical anthropologists have contributed to the debates surrounding the globalization of health.
Credit Only Granted for: ANTH310, ANTH465 or ANTH665.

ANTH666 Anthropology of Work (3 Credits)
Examines the concept and meaning of work, the different types of work, and how the development of time discipline became essential for the creation of capitalist labor. Explores the contemporary social justice movement and its impact on gender and racialized inequities. Includes an exploration of deindustrialized regions in the Rust Belt.
Jointly offered with: ANTH466.
Credit Only Granted for: ANTH466 or ANTH666.

ANTH669 Advanced Developments in Cultural Anthropology (3 Credits)
Graduate cultural anthropology courses on varying topics derived from new interests of the faculty or the specialties of visiting scholars.
Restriction: Permission of BSOS-Anthropology department.
Repeatable to: 6 credits if content differs.

ANTH673 Native American Languages and Cultures (3 Credits)
An introduction to Native American Languages and Cultures from a linguistic anthropological perspective. Topics to be explored include Native American identities, the stucture of Native languages, oral traditions, narrative story-telling, Native language and thought (Sapir/Whorf), language shift, linguistic revitalization, documentation of endangered languages, indigenous representation and appropriation, and racializing discourses.
Jointly offered with: ANTH473.
Credit Only Granted for: ANTH673 or ANTH473.

ANTH674 Language Racism & Identity (3 Credits)
This course explores the relationship between language, identity and racism in a variety of social contexts, in the U.S. and elsewhere.
Jointly offered with: ANTH474.
Credit Only Granted for: ANTH474, ANTH469R, ANTH674, or ANTH689R.

ANTH688 Current Developments in Anthropology (3 Credits)
Detailed investigation of a current problem or research technique, the topic to be chosen in accordance with faculty interests and student needs.
Repeatable to: 9 credits if content differs.

ANTH689 Special Problems in Anthropology (1-6 Credits)

ANTH696 Field Methods in Archaeology (6 Credits)
Field training in the techniques of archaeological survey and excavation.
Formerly: ANTH699.

ANTH698 Advanced Field Training in Ethnology (1-6 Credits)
Experience in field research utilizing a variety of enthnographic methods of inquiry.
Repeatable to: 6 credits if content differs.
Credit Only Granted for: ANTH498 or ANTH698.

ANTH701 Anthropology Internship Preparation (3 Credits)
Preparation for internship includes practicum training in development, presentation and evaluation of position papers, proposals and work plans; literature search and use of secondary data sources in decision making the effect cultural analysis and resource management; ethics and professional development for work in non-academic settings.

ANTH712 Anthropology Internship Analysis (3 Credits)
The preparation and presentation of internship results, and the development of skills in report writing and presentation. Includes the completion of a professional quality report or publishable paper based on the internship experience.
Prerequisite: ANTH789.

ANTH722 Ecological Anthropology (3 Credits)
An overview of important approaches to ecological anthropology. Population, systems, community, political, behavioral and evolutionary ecology will be examined as they have been applied to a range of anthropological questions. Complexity theory (nonlinear dynamics) and topics in game theory will also be addressed. Students will map the field of ecological anthropology and to assess the strengths and weaknesses of contemporary approaches, methods and theories.
Restriction: Must be in one of the following programs (Anthropology (Doctoral); Anthropology (Master's)).
Credit Only Granted for: ANTH720 or ANTH722.

ANTH740 Theories of the Past and Accomplishments of Archaeology (3 Credits)
The primary purpose is to highlight some of the key achievements made by archaeologists in informing questions of interest to society from 1850 on. Key achievements include how archaeologists understand elements of the past thought to be central to the development of modern socieity. A secondary purpose is to introduce students to the theories used to understand the place of the past in society and the function of answers to questions thought central to modern social life.
Credit Only Granted for: ANTH689P or ANTH740.
Formerly: ANTH689P.

ANTH741 Introduction to Cultural and Heritage Resource Management (3 Credits)
An introduction to the field of cultural and heritage resource management. Examines existing international, national, and local frameworks for the protection of cultural heritage. Provides an overview of employment opportunities and ethical responsibilities within the profession.
Restriction: Must be in the Cultural and Heritage Resource Management Master or Post-Baccalaureate Certificate of Professional Studies Programs; or by permission of the Anthropology department.

ANTH742 Advanced Methods in CRM (3 Credits)
An examination of the range of nondestructive technologies used to research and image cultural and heritage resources. Standard archaeological survey methods will be covered and will focus on remote sensing technologies and how an integrated approach to archaeological investigation can reveal vital information for resource planning, interpretation, and outreach.
Restriction: Must be in the Cultural and Heritage Resource Management Program (CHRM); or by permission of the Anthropology department.

ANTH743 Community Engagement and Consultation (3 Credits)
A grounding in cultural communication and sensitivity to community, cultural, and stakeholder needs within and beyond project specific confines. Using the broader context of practicing anthropology in the exploration of communication styles, learning styles, and cultural biases and taboos, students are exposed to underlying concepts concerning inter-cultural communication so that they may develop more collaborative approaches to research. The program also provides background in the development of public outreach programs in the context of cultural and heritage resource management.
Restriction: Must be in the Cultural and Heritage Resource Management Program (CHRM); or by permission of the Anthropology department.

ANTH744 Collections, Data Management and Cultural Materials Preservation (3 Credits)
An overview of the process of collecting cultural materials and samples with the goal of obtaining as much information during analysis as possible followed by content relating to archaeological curation and collections management. Provides information on the preservation of cultural materials from the time they leave the field until they are placed in a certified collections facility.
Restriction: Must be in the Cultural and Heritage Resource Management Program (CHRM); or by permission of the Anthropology department.

ANTH745 International Heritage Management (3 Credits)
An examination of international heritage management practices and global ethical and professional norms in order to contextualize domestic cultural resource management in the US. The survey will also explore the linkages and areas for growth between international and domestic heritage practice.
Restriction: Must be in the Cultural and Heritage Resource Management Program; or by permission of the Anthropology department.

ANTH746 Applied Archaeological Theory (3 Credits)
Does cultural and heritage resources management (CHRM) need theory? Can archeological theory help us understand CHRM conventions and configurations, and does CHRM have its own distinctive contribution to make to archaeological theory? This course explores these questions while surveying the key areas of theory that inform the work that CHRM practitioners do, and also the place of CHRM in cultural discourse.
Restriction: Must be in the Cultural and Heritage Resource Management Program; or by permission of the Anthropology department.

ANTH747 Business of CRM (3 Credits)
An overview of the skills necessary for success in managing a CRM program. Students will learn how CRM organizations market and manage clients, prepare and submit budgets and proposals, and coordinate technical staff to successfully complete projects. Topics will address the range of issues that owners and managers are confronted with in their oversight of projects, including the management of employees, ethics and professional responsibilities, ensuring health and safety, and meeting the many contractual obligations of CRM projects.
Restriction: Must be in the Cultural and Heritage Resource Management Masters Program (MPCH) or certificate (Z121) ; or by permission of the Anthropology department.

ANTH749 Cultural and Heritage Resource Management Internship (1-6 Credits)
An internship/practicum that would contribute to students' understanding of the overall process of CHRM. Students who are already working in CRM or a closely related field may use their employment as their practicum if the opportunity is available for them to learn beyond their current job duties.
Restriction: Must be in the Cultural and Heritage Resource Management Program (CHRM).
Repeatable to: 12 credits if content differs.

ANTH751 Project Management (3 Credits)
This capstone class for the MPS in CHRM provides students with a grounding in the critical thinking processes necessary during each stage of the CRM process. It provides students with insights into the processes used as research questions are translated into data and then into an evaluative report. Students review examples of appropriate and inappropriate technical reports and then analyze the reports to understand the thinking processes necessary for project management to provide the client with the documentation necessary for completing the compliance process.
Restriction: Must be in the Cultural and Heritage Resource Management Master's Program (MPCH) or certificate (Z121) ; or by permission of the Anthropology department.

ANTH752 Introduction to GIS for CRM (3 Credits)
Builds foundational competence for using geographical information systems (GIS) in the field of cultural resources management (CRM), including a basic understanding of how to work in ArcGIS, and the types of data analysis and presentation that are possible within GIS applications.

ANTH760 Development of Social/Cultural Theory (3 Credits)
A broad perspective of the history of social cultural theory in anthropology and the critical skills needed for understanding the subdiscipline is provided. An overview of the history of theorizing about society and culture will help outline the past, present, and future of anthropology and its relations with other scientific and humanistic disciplines.

ANTH788 Internship Research (1-3 Credits)
This course augments ANTH 789 and is graded in conjunction with it.
Prerequisite: ANTH701.
Restriction: Permission of BSOS-Anthropology department; and must be in one of the following programs (Anthropology (Master's); Anthropology (Doctoral)).

ANTH789 Internship (1-6 Credits)
Individual instruction course supervised by a department faculty member.
Prerequisite: ANTH701.
Repeatable to: 6 credits if content differs.
Formerly: ANTH705.

ANTH799 Master's Thesis Research (1-6 Credits)

ANTH856 Museum Research Seminar (3 Credits)
A research seminar focusing on the practice and presentation of cultural and historical scholarship in museums and historical sites. Students will complete an original research project on the challenges and opportunities of public exhibition and interpretation of cultural and historical research.
Prerequisite: AMST655, ANTH655, or HIST610.
Cross-listed with: AMST856, HIST810, INST786.
Credit Only Granted for: AMST856, ANTH856, HIST810, INST728U or INST786.

ANTH857 Museum Scholarship Practicum (3-6 Credits)
Students devise and carry out a research program using the collections at the Smithsonian Institution or some other cooperating museum, working under joint supervision of a museum professional and a university faculty member.
Prerequisite: AMST856, ANTH856, or HIST810.
Cross-listed with: AMST857, HIST811, INST787.
Restriction: Permission of Museum Scholarship Program required.
Credit Only Granted for: AMST857, ANTH857, HIST811, INST728I or INST787.

ANTH898 Pre-Candidacy Research (1-8 Credits)

ANTH899 Doctoral Dissertation Research (1-6 Credits)

AOSC - Atmospheric and Oceanic Science

AOSC400 Physical Meteorology (3 Credits)
The application of basic classical physics, chemistry and mathematics to the study of the atmosphere. Composition of the atmosphere; energy sources and sinks (radiation in the atmosphere; radiative balance and radiative forcing of atmospheric processes); atmospheric thermodynamics; clouds and precipitation physics; atmospheric electricity and optics; mesoscale processes (e.g., orographic mesoscale phenomena and instabilities); air mass boundaries; severe weather, tropical cyclones; storms; global circulation.
Prerequisite: 1 course with a minimum grade of C- from (PHYS171, PHYS161, MATH141); or permission of CMNS-Atmospheric & Oceanic Science department.

AOSC401 Climate Dynamics and Earth System Science (3 Credits)
Introduction of the earth and global climate systems and their major components: atmosphere, land, ocean, biosphere and cryosphere. Key processes governing the function of the earth's climate: Global energy balance and water cycle, climate dynamics (general circulation of the atmosphere and ocean) and climate physics (aerosol, cloud and rain), as well as climate variability and climate changes. Phenomena resulting from this coupled system including El Nino-Southern Oscillation, monsoons, and the hydrological cycle will be discussed, with a focus on how the Earth System responds to global warming.
Prerequisite: AOSC400 or AOSC200; and MATH141; and (PHYS161 or PHYS171). Or permission of instructor.

AOSC420 Physical Oceanography (3 Credits)
Ocean observations. Water masses, sources of deep, intermediate, and surface water. Mass, heat, and salt transport, and the meridional overturning circulation. Geochemical tracers and cycles, including carbon. Western boundary currents, mixed layers, and processes maintaining the thermocline. Coastal and estuarine processes. Surface waves and tides. the ocean's role in climate.
Prerequisite: MATH141 and PHYS141.
Recommended: AOSC200. Also offered as: GEOL670, AOSC670.
Credit Only Granted for: AOSC420, AOSC670, or GEOL670.

AOSC424 Remote Sensing of the Atmosphere and Ocean (3 Credits)
Many of the properties of the atmosphere, ocean, and land surface are most easily observed from satellite remote sensing. This course will provide students with a hands-on introduction to a variety of passive and active sensing techniques and sensors observing our changing environment. Topics include: orbital dynamics and electromagnetic properties of the atmosphere and surface; atmospheric emission characteristics and scattering; chemical composition and spectroscopy; temperature retrievals; detection and retrieval of aerosol, cloud and rain; ocean surface properties; sea surface temperature and color; active sensing of wind stress, sea level, and internal waves; time-dependent gravity; properties of vegetation and ice.
Prerequisite: 1 course with a minimum grade of C- from (PHYS171, PHYS161, MATH141); or permission of instructor.

AOSC431 Atmospheric Thermodynamics (3 Credits)
Classical thermodynamics applied to both the dry and the moist atmosphere. Composition; phase changes of water; stability concepts; Properties of aerosols and clouds, cloud nucleation and precipitation processes, atmospheric electricity, cloud and precipitation chemistry.
Prerequisite: 1 course with a minimum grade of C- from (PHYS171, PHYS161, MATH141).
Recommended: MATH246.

AOSC432 Dynamics of the Atmosphere and Ocean (3 Credits)
Equations of motion and their approximation, scale analysis for the atmosphere and the ocean. Conservation properties. Fluid motion in the atmosphere and oceans. Geostrophic/balanced and ageostrphic/unbalanced motion. Circulation, vorticity, and potential vorticity. Introduction to the boundary layer.
Prerequisite: AOSC431.
Corequisite: MATH246.
Credit Only Granted for: AOSC432 or AOSC632.
Formerly: METO432.

AOSC433 Atmospheric Chemistry and Climate (3 Credits)
The effects of human activity on atmospheric composition, focused on global warming, the carbon cycle, air pollution, and the ozone layer. Fundamentals of atmosphereic chemistry (spectroscopy, kinetics, isotopic analysis, and biogeochemical cycles) are related to the modern understanding of climate change, air quality, and ozone depletion, based on resources such as satellite missions, field campaigns, and scientific assessments published by international agencies. We also examine how society's energy needs could be met, in the future, in a manner with less impact on atmospheric composition than the present heavy reliance on combusion of fossil fuels.
Prerequisite: CHEM131, CHEM135, or CHEM146. And MATH241; or permission of CMNS-Atmospheric & Oceanic Science department; or permission of CMNS-Chemistry & Biochemistry department. Cross-listed with CHEM433.
Credit Only Granted for: AOSC433, AOSC633, CHEM433, or CHEM633.
Formerly: AOSC434.

AOSC434 Air Pollution and Environmental Justice (3 Credits)
Basic concepts in physics and chemistry of the atmosphere as applied to air pollution and environmental justice. Production, transformation, spatial scales, transport, and removal of air pollutants. The problems of photochemical smog, the greenhouse effect & climate change, stratospheric ozone, visibility. Numerical simulation of air pollution. Health and environmental effects of air pollution in the developed and developing world; why some communities suffer disproportionately
Prerequisite: CHEM131 and MATH241; or permission of instructor.

AOSC436 Principles of Biogeochemistry (3 Credits)
An introduction to the basic principles of biogeochemistry including aspects of organic geochemistry, biochemistry, microbiology, global geochemical cycles, the origin of life and paleoenvironmental evolution.
Prerequisite: MATH120 or MATH140; or must have completed MATH220. And (GEOL100 or GEOL120); and GEOL322. And CHEM131 and CHEM132; or (CHEM135 and CHEM136).
Cross-listed with: GEOL436.
Restriction: Non-degree-seeking students require the permission of the instructor.
Credit Only Granted for: GEOL436 or AOSC436.

AOSC437 Global Climate Change: Past and Present (3 Credits)
Introduction to the processes by which climate varies, the paleoclimate record, and projections of climate change into the 21st century, including discussion of climate sensitivity to external radiative forcing.
Prerequisite: MATH115 or MATH140; and (GEOL100 or GEOL120); and (CHEM131 or CHEM135); and (CHEM132 or CHEM136).
Cross-listed with: GEOL437.
Jointly offered with: GEOL637, AOSC685.
Credit Only Granted for: GEOL437, GEOL637, AOSC437 or AOSC685.

AOSC440 Polar Remote Sensing (3 Credits)
The harsh environment of the vast polar regions makes them some of the most inaccessible places on Earth. With widespread environmental change already underway, satellite remote sensing provides the only means by which to obtain year-round observations of the polar climate system. The objective of this course is to provide students with an overview of polar remote sensing techniques, including the physical principles of active and passive sensors, orbits, electromagnetic radiation, atmospheric transmission, calibration and validation. We will focus on measurements of the polar oceans, sea ice, glaciers, ice sheets, snow and permafrost, and examine the response of the cryosphere to climate change.
Prerequisite: PHYS171 or PHYS161; and AOSC401 or GEOG301; or with permission of instructor.
Cross-listed with: GEOG440.
Jointly offered with: AOSC642.
Credit Only Granted for: AOSC440, GEOG440, AOSC642, or GEOG640.

AOSC447 Machine Learning in Earth Science (3 Credits)
A comprehensive introductory course designed to prepare undergraduate and graduate students for applying machine learning techniques to solve real-world problems in Earth science. It emphasizes practical solution implementation, providing students with essential hands-on experience using the most popular open-source analytics tools based on Python, a general-purpose programming language. The course works through all steps in machine learning, from problem specification, data analytics to analytical solution, and applies advanced statistical and analytical algorithms to uncover hidden data relationships and transform them into predictive understanding or decision support. The topics covered include: Python programming, SciPy and Scikit-learn utility, data engineering, visualization, classifiers, regression models, canonical correlation analysis, structural equation models, decision trees, random forests, boosting machines, support vector machines, clustering, dimensionality reduction, principal component analysis, and neural networks.
Prerequisite: Must have completed MATH140.

AOSC458 Advanced Topics in Atmospheric and Oceanic Science (1-4 Credits)
Special topics in atmospheric and oceanic science are given intensive study. The topic of concentration varies, from semester to semester and depends on student and faculty interests. Often, specialists from other institutions are invited to the campus on a visiting lectureship basis to conduct the course.
Repeatable to: 12 credits.

AOSC462 Ecohydrology (3 Credits)
Focuses on the study of hydrologically-controlled ecosystems, e.g. systems in which either excess and/or deficit of water and nutrients are determinants of its structure and function. Such systems have complex dynamic characteristics that depend on many interrelated links between climate, soil and vegetation.
Prerequisite: MATH240, MATH241 and MATH246; or permission of instructor.
Jointly offered with: AOSC662.
Credit Only Granted for: AOSC462 or AOSC662.

AOSC463 Water and Climate Systems (3 Credits)
Focuses on exploring the relationships between water, climate, land, energy, and the economy (the so called "nexus") through an interwoven understanding of the physical, economic, and institutional relationships and constraints that influence management and decision-making process in water supply, energy generation and food production. The course emphasizes the use of integrated assessment (IA) modeling tools as a way to formalize these relationships and explore their implications. Lectures will be complemented with online discussion sessions and applied modeling exercises to get hands-on knowledge of practical solutions to nexus challenges.
Prerequisite: MATH240, MATH241 and MATH246; or permission of instructor.
Jointly offered with: AOSC663.
Credit Only Granted for: AOSC463 or AOSC663.
Additional Information: This course is offered through a joint effort of the Earth System Science Interdisciplinary Center (ESSIC, part of UMDb Sciences) and the Joint Global Change Research Institute (a collaboration between UMD and the US Dept of Energyb Northwest National Laboratory).

AOSC470 Synoptic Meteorology (3 Credits)
Atmospheric properties and observations, meteorological analysis and charts, operational numerical forecasts. Application of quasigeostrophic theory, baroclinic instability, midlatitiude and mesoscale weather systems. Tropical meteorology. Weather forecasting using numerical and statistical models. Prediction of weather phenomena on the global, syoptic, meso, and local scales. Analysis of surface and upper air data; Norwegian cyclone model; introduction to weather forecasting.
Prerequisite: Minimum grade of C- in AOSC431 and AOSC432.
Credit Only Granted for: AOSC470, AOSC600, or METO600.

AOSC472 Mesoscale Meteorology (3 Credits)
Survey a broad range of mesoscale meteorological features with emphasis on convection and associated phenomena. Define the mesoscale and understand its underlying principles; Introduce non-convective circulations and their importance for weather forecasting; Understand the precursors and occurrence of deep moist convection.
Prerequisite: AOSC432, AOSC600, AOSC610, or AOSC470.
Jointly offered with: AOSC602.
Restriction: Non-degree-seeking students require the permission of the instructor.
Credit Only Granted for: AOSC472 or AOSC602.

AOSC475 Carbon Cycle and Climate: Past, Present, and Future (3 Credits)
The fundamentals of the Earth's carbon cycle, a key biogeochemical cycl that controls Earth's climate and life. The changing characteristics of the carbon cycle on several timescales, ranging from geological, interannual, and the more recent anthropogenic influences on carbon cycle and climate. The carbon cycle in the atmosphere, land, ocean, and the biosphere. The underlying human activities such as fossil fuel burning and deforestation that are responsible for the increase in the atmosphere CO2 and our future options in dealing with the carbon problem such as alternative energy and carbon sequestration.
Jointly offered with: AOSC675.
Credit Only Granted for: AOSC475 or AOSC6 75.

AOSC480 Introduction to Earth System Science (3 Credits)
Focuses on exploring the relationships between the atmosphere, the oceans, water, climate, land, vegetation, energy, and human systems through an interwoven understanding of the physical, biogeochemical and socioeconomic relationships and constraints that influence management and decision-making processes in societal issues such as water supply, power generation, food production, ecosystem services and others. The course introduces integrated assessment (IA) science as a framework to formalize these relationships and explore their implications.
Prerequisite: MATH240, MATH241 and MATH246; or permission of instructor.
Jointly offered with: AOSC680.
Credit Only Granted for: AOSC480 or AOSC680.
Additional Information: This course is offered through a joint effort of the Department of Atmospheric and Oceanic Science (AOSC) and the Earth System Science Interdisciplinary Center (ESSIC).

AOSC484 Climate System Modeling (3 Credits)
Fundamentals in building computer models to simulate the components of the climate system: atmosphere, ocean ice, land-surface, terrestrial and marine ecosystems, and the biogeochemical cycles embedded in the physical climate system, in particular, the carbon cycle. Simple to state-of-the-art research models to tackle problems such as the Daisy World, El Nino and global warming.
Jointly offered with: AOSC684.
Credit Only Granted for: AOSC484 or AOSC6 84.

AOSC493 Senior Research Project I (3 Credits)
Technical writing and oral presentation skills. Planning, writing, and presenting a plan for research in the geosciences.
Prerequisite: Permission of CMNS-Atmospheric & Oceanic Science department.
Restriction: Must be in Atmospheric and Oceanic Science program; or permission of instructor.

AOSC494 Atmospheric and Oceanic Science Seminar (1 Credit)
Exposure to a wide range of contemporary topics in atmospheric, oceanic, and climate sciences, to foster research interests and promote critical thinking through the weekly AOSC departmental seminar series.
Prerequisite: Minimum grade of C- in AOSC431 and AOSC432.
Restriction: Permission of the Atmospheric and Oceanic Science Department.

AOSC498 Senior Research Project II (3 Credits)
The project will be based on the research or development plan created in AOSC493. It may be completed with the approval of a faculty advisor in conjunction with an internship. Final written thesis and oral defense will be expected.
Prerequisite: AOSC493.

AOSC499 Special Problems in Atmospheric Science (1-3 Credits)
Research or special study in the field of meteorology and the atmospheric and oceanic sciences.
Prerequisite: Permission of CMNS-Atmospheric & Oceanic Science department.
Repeatable to: 6 credits.

AOSC600 Synoptic Meteorology I (3 Credits)
Atmospheric properties and observations, meteorological analysis and charts, operational numerical forecasts. Application of quasigeostrophic theory, baroclinic instability, midlatitude and mesoscale weather systems. Tropical meteorology.
Prerequisite: AOSC610.

AOSC602 Mesoscale Meteorology (3 Credits)
Survey a broad range of mesoscale meteorological features with emphasis on convection and associated phenomena. Define the mesoscale and understand its underlying principles; Introduce non-convective circulations and their importance for weather forecasting; Understand the precursors and occurrence of deep moist convection.

AOSC610 Dynamics of the Atmosphere and Ocean I (3 Credits)
Equations of motion and their approximation, scale analysis for the atmosphere and the ocean. Conservation properties. Fluid motion in the atmosphere and oceans. Circulation and vorticity, geostrophic motion and the gradient wind balance. Turbulence and Ekman Layers.
Prerequisite: Must have completed or be concurrently enrolled in MATH462; or students who have taken courses with comparable content may contact the department.

AOSC611 Dynamics of the Atmosphere and Oceans II (3 Credits)
Waves and instabilities in the atmosphere and the ocean. Gravity, Rossby, coastal and equatorial waves. Flow over topography. Dynamic instabilities including barotropic, baroclinic, inertial, and instabilities of the coupled ocean-atmosphere system. Stationary waves and multiple equilibria.

AOSC614 Atmospheric Modeling, Data Assimilation and Predictability (3 Credits)
Solid foundation for atmospheric and oceanic modeling and numerical weather prediction: numerical methods for partial differential equations, an introduction to physical parameterizations, modern data assimilation, and predictability.
Prerequisite: AOSC610; or permission of instructor.

AOSC615 Data Assimilation (3 Credits)
An overview of fundamental methods of data assimilation. Theory, techniques, potentials, and strategies of these methods, as well as their possible drawbacks. Hands-on experimentation through applications.

AOSC617 Atmospheric and Oceanic Climate (3 Credits)
The general circulation of the atmosphere and oceans, historical perspective, observations, and conceptual models; wind-driven and thermohaline circulation of the oceans. Seasonal cycle and monsoon circulations; interannual to interdecadal climate variability; climate change.
Prerequisite: AOSC610; or permission of instructor.

AOSC620 Physics and Chemistry of the Atmosphere I (3 Credits)
Air parcel thermodynamics and stability; constituent thermodynamics and chemical kinetics. Cloud and aerosol physics and precipitation processes.
Prerequisite: MATH461; or students who have taken courses with comparable content may contact the department.

AOSC621 Physics and Chemistry of the Atmosphere II (3 Credits)
Spectroscopy; basic concepts in radiative transfer and atmospheric chemistry; photolysis rates for atmospheric molecules.
Prerequisite: MATH462; or students who have taken courses with comparable content may contact the department.

AOSC625 Remote Inference of Atmospheric Properties by Satellite (3 Credits)
Fundamentals of radiative transfer concepts, theories and models pertinent to remote sensing. Satellite platforms, sensors and systems used for operation and research in atmospheric remote sensing. Concepts and technologies of passive and active remote sensing. Remote sensing methods and products of atmospheric constituents, aerosol, cloud, precipitation, temperature and water vapor profiles, precipitation in liquid and ice forms, radiation budget, and remote sensing application in data assimilation for numerical weather forecast (NWP); use of atmospheric remote sensing products for development of global climate model (GCM).

AOSC630 Statistical Methods in Meteorology and Oceanography (3 Credits)
Parametric and non-parametric tests; time series analysis and filtering; wavelets. Multiple regression and screening; neural networks. Empirical orthogonal functions and teleconnections. Statistical weather and climate prediction, including MOS, constructed analogs. Ensemble forecasting and verification.
Prerequisite: STAT400; or students who have taken courses with comparable content may contact the department.

AOSC632 Atmsopheric Dynamics (3 Credits)
The equations of motion of the atmosphere are developed, and then analyzed with a focus on developing students' intuition about the behavior of the large-scale atmospheric flow in the mid-latitudes. Topics covered: Kinematics; forces in the atmosphere; apparent forces arising from the rotation of the earth; vertical coordinate systems; spherical coordinate; natural coordinates; hydrostatic, cyclostrophic; geostrophic and gradient wind balances; diagnosis of vertical motion (the omega equation); prediction of surface pressure; dynamics of fronts; lifecycle of baroclinic distrubances; introduction to climate sensitivity and climate feedbacks.
Prerequisite: AOSC431.
Corequisite: MATH246.
Restriction: Must not have completed AOSC432.
Credit Only Granted for: AOSC432 or AOSC632.

AOSC633 Atmospheric Chemistry and Climate (3 Credits)
The effects of human activity on atmospheric composition, focused on global warming, the carbon cycle, air pollution, and the ozone layer. Fundamentals of atmosphereic chemistry (spectroscopy, kinetics, isotopic analysis, and biogeochemical cycles) are related to the modern understanding of climate change, air quality, and ozone depletion, based on resources such as satellite missions, field campaigns, and scientific assessments published by international agencies. We also examine how society's energy needs could be met, in the future, in a manner with less impact on atmospheric composition than the present heavy reliance on combusion of fossil fuels.
Prerequisite: CHEM131, CHEM135, or CHEM146.
Cross-listed with: CHEM633.
Credit Only Granted for: AOSC433, AOSC633, CHEM433, or CHEM633.

AOSC634 Air Sampling and Analysis (3 Credits)
Theory and application of analytical techniques for the analysis of atmospheric gases and particles including priority pollutants. Combined chemical and meteorological considerations in designing field experiments.

AOSC642 Polar Remote Sensing (3 Credits)
The harsh environment of the vast polar regions makes them some of the most inaccessible places on Earth. With widespread environmental change already underway, satellite remote sensing is the only way to obtain year-round observations of the polar climate system. The objective of this course is to provide students with an overview of polar remote sensing techniques, including the physical principles of active and passive sensors, orbits, electromagnetic radiation, atmospheric transmission, calibration and validation. We will focus on measurements of the polar oceans, sea ice, glaciers and ice sheets and examine the response of the cryosphere to climate change.
Prerequisite: PHYS171 or PHYS161; and AOSC401 or GEOG301; or with permission of instructor.
Cross-listed with: GEOG640.
Jointly offered with: AOSC440.
Credit Only Granted for: AOSC440, GEOG440, AOSC642, or GEOG640.

AOSC647 Machine Learning in Earth Science (3 Credits)
A comprehensive introductory course designed to prepare undergraduate and graduate students for applying machine learning techniques to solve real-world problems in Earth science. It emphasizes practical solution implementation, providing students with essential hands-on experience using the most popular open-source analytics tools based on Python, a general-purpose programming language. The course works through all steps in machine learning, from problem specification, data analytics to analytical solution, and applies advanced statistical and analytical algorithms to uncover hidden data relationships and transform them into predictive understanding or decision support. The topics covered include: Python programming, SciPy and Scikit-learn utility, data engineering, visualization, classifiers, regression models, canonical correlation analysis, structural equation models, decision trees, random forests, boosting machines, support vector machines, clustering, dimensionality reduction, principal component analysis, and neural networks.
Prerequisite: MATH140.
Jointly offered with: AOSC447.
Credit Only Granted for: AOSC447 or AOSC647.

AOSC652 Analysis Methods in Atmospheric and Oceanic Science (3 Credits)
A variety of the analysis methods used by atmospheric and oceanic scientists will be applied to observational data sets such as Vostok ice core record, temperature trends, and satellite measurements of ozone,sea ice, etc. in a hands-on, computer laboratory setting. Students will be exposed to Fortran and Python as well as modern file formats such as HDF and netCDF. No prior programming experience required.
Prerequisite: PHYS141 and MATH241; or students who have taken courses with comparable content may contact the department.
Recommended: AMSC460, CMSC660, AMSC660, or CMSC460.

AOSC658 Special Topics in Meteorology (1-4 Credits)
Various special topics in meteorology are given intensive study. The topic of concentration varies, from semester to semester and depends on student and faculty interests. Often, specialists from other institutions are invited to the campus on a visiting lectureship basis to conduct the course.
Restriction: Permission of instructor.
Repeatable to: 10 credits if content differs.

AOSC663 Water and Climate Systems (3 Credits)
Focuses on exploring options for adaptation and building resilience to the possible impacts of climate change through an interwoven understanding of the physical, biological, social, cultural, economic and institutional constraints of water resources issues and consideration of climate-related risks in the management and decision-making process.
Prerequisite: AOSC610; and undergraduate level hydrology and/or hydrogeology, familiarity with differential calculus and equations. Please consult with instructor for details.

AOSC670 Physical Oceanography (3 Credits)
Ocean observations. Water masses, sources of deep water. Mass, heat, and salt transport, geochemical tracers. Western boundary currents, maintenance of the thermocline. Coastal and estuarine processes. Surface waves and tides. Ocean climate.
Prerequisite: Permission of CMNS-Atmospheric & Oceanic Science department; or permission of CMNS-Geology department.
Cross-listed with: GEOL670.
Credit Only Granted for: GEOL670, AOSC670 or AOSC420.

AOSC675 Carbon Cycle and Climate: Past, Present, and Future (3 Credits)
The fundamentals of the Earth's carbon cycle, a key biogeochemical cycle that controls Earth's climate and life. The changing characteristics of the carbon cycle on several timescales, ranging from geological, interannual, and the more recent anthropogenic influences on carbon cycle and climate. The carbon cycle in the atmosphere, land, ocean, and the biosphere. The underlying human activities such as fossil fuel burning and deforestation that are responsible for the increase in the atmosphere CO2 and our future options in dealing with the carbon problem such as alternative energy and carbon sequestration.Jointly offered with AOSC475.
Credit Only Granted for: AOSC475 or AOSC6 75.

AOSC680 Introduction to Earth System Science (3 Credits)
An introduction to the study of the earth as a system: atmosphere, oceans, land, cryosphere, solid earth, and humans. Cycling of materials and energy in the earth system: the energy cycle, the hydrologic cycle, the carbon cycle, the nitrogen cycle. Climate processes and variability: land-atmosphere, ocean-atmosphere, biosphere-climate, and human interactions, short- and long-term variability in climate.

AOSC684 Climate System Modeling (3 Credits)
Fundamentals in building computer models to simulate the components of the climate system: atmosphere, ocean ice, land-surface, terrestrial and marine ecosystems, and the biogeochemical cycles embedded in the physical climate system, in particular, the carbon cycle. Simple to state-of-the-art research models to tackle problems such as the Daisy World, El Nino and global warming.Jointly offered with AOSC484.
Credit Only Granted for: AOSC484 or AOSC6 84.

AOSC685 Global Climate Change: Past and Present (3 Credits)
Introduction to the processes by which climate varies, the paleoclimate record, and projections of climate change into the 21st century, including discussion of climate sensitivity to external radiative forcing.
Prerequisite: MATH115 or equivalent; two 400 level GEOL courses or equivalent; or permission of the instructor.
Cross-listed with: GEOL637.
Jointly offered with: GEOL437, AOSC437.
Credit Only Granted for: GEOL437, GEOL637, AOSC437 or AOSC685.

AOSC798 Directed Graduate Research (1-3 Credits)
Directed graduate research in atmospheric and oceanic science.
Repeatable to: 15 credits.

AOSC818 Frontiers in Atmosphere, Ocean, Climate, and Synoptic Meteorology Research (1 Credit)
A broad range of topics in the contemporary sciences of atmosphere, ocean, climate and synoptic meteorology are covered.
Repeatable to: 18 credits if content differs.

AOSC898 Pre-Candidacy Research (1-8 Credits)

AOSC899 Doctoral Dissertation Research (1-8 Credits)

ARAB - Arabic

ARAB401 Readings in Arabic Literature (3 Credits)
A survey of Modern Arabic literature is given through a range of selected texts. Texts are studied as literature with constant reference to the social, cultural and political contexts in which they were written. Taught in Arabic.
Prerequisite: ARAB305; or permission of ARHU-School of Languages, Literatures, and Cultures department.
Restriction: Must not be a fluent/native speaker of Arabic.

ARAB410 Ideology of Stereotyping: American and Middle Eastern Film and Television (3 Credits)
Exploration of cultural stereotyping, using examples from American and Middle Eastern cinema and television. Students will examine ideological constructs of Otherness and its history, including Orientalism; propaganda techniques; and audiovisual aspects of stereotyping. While the focus is on American and Middle Eastern cultural production, the course will engage broader issues of stereotyping in contemporary society and media. Readings include theories of propaganda and cultural ideology.
Cross-listed with: CINE429Q.
Credit Only Granted for: ARAB410 or CINE429Q.

ARAB489 Special Topics in Arabic Studies (3 Credits)
In-depth study of particular aspect of Arabic language and culture. Specific topics to be announced when course is offered. Taught in Arabic.
Prerequisite: ARAB305; or permission of ARHU-School of Languages, Literatures, and Cultures department.

ARAB499 Special Topics in Arabic Studies (3 Credits)
In-depth study of particular aspect of Arabic culture, literature and language. Specific topic to be announced when course is offered.
Repeatable to: 18 credits if content differs.

ARAB628 Special Topics in Arabic Studies (3 Credits)
In-depth study of a particular aspect of Arabic Studies. Topics to be announced when course if offered. Taught in Arabic.
Prerequisite: Permission of ARHU-School of Languages, Literatures, and Cultures department.
Repeatable to: 6 credits if content differs.

ARAB638 Special Topics in Middle Eastern Studies (3 Credits)
In-depth study of a particular aspect of Middle Eastern Studies. Topic to be announced when course is offered. Taught in Arabic.
Prerequisite: Permission of ARHU-School of Languages, Literatures, and Cultures department.
Repeatable to: 6 credits if content differs.

ARAB788 Internship in Arabic (3-6 Credits)
Field and/or professional experience in a public or private institution where Arabic is the language of work.
Restriction: Permission of ARHU-School of Languages, Literatures, and Cultures department.
Repeatable to: 6 credits if content differs.

ARAB789 Independent Study in Arabic (1-3 Credits)
Independent study in Arabic. Taught in Arabic.
Prerequisite: Permission of ARHU-School of Languages, Literatures, and Cultures department.
Repeatable to: 9 credits if content differs.

ARCH - Architecture

ARCH400 Architecture Design Studio I (6 Credits)
Introduction to architectural design with particular emphasis on conventions and principles of architecture, visual and verbal communication skills, formal analysis, design process, spatial composition, architectural promenade, basic program distribution, and elementary constructional and environmental responses.
Prerequisite: ARCH300; or permission of ARCH-Architecture Program.
Restriction: Must be in a major in ARCH-Architecture Program; and permission of ARCH-Architecture Program.

ARCH401 Architecture Design Studio II (6 Credits)
Continuation of ARCH 400 with introduction to building typology, urban and contextual issues, design of the vertical surface, and architectural interiors.
Prerequisite: Minimum grade of C- in ARCH400.
Restriction: Must be in Architecture (B.S.) program.

ARCH402 Architecture Design Studio III (6 Credits)
Architectural design studio with emphasis on building and facade typologies, the development of architectural promenade and sequence, public and/or civic infill buildings dependent upon the architectural promenade, and urban housing types of varying densities. The architect's obligations to urban context are explored in many dimensions including historical, typological, and physical.
Prerequisite: Minimum grade of C- in ARCH401.
Restriction: Must be in Architecture (B.S.) program.

ARCH403 Architecture Design Studio IV (6 Credits)
Investigations into the relationship between the man-made and the natural world including introductory issues of assembly and material value. Design of the site and the building are combined into an integral process delimiting and probing the boundaries of each and exploring their reciprocal relationship. The architect's obligations to the natural and urban contexts are explored in many dimensions including historical, typological, environmental, and physical.
Prerequisite: Minimum grade of C- in ARCH402.
Restriction: Must be in Architecture (B.S.) program.

ARCH404 Graduate Architecture Design Studio I (6 Credits)
Introduction to architectural design with particular emphasis on conventions and principles of architecture , visual and verbal communication skills, formal analysis, design process, spatial composition, architectural promenade, basic program distribution, and elementary constructional and environmental responses. Offered fall only.
Recommended: For 3 1/2 year graduate students only.
Restriction: Must be in Architecture (Master's) program.

ARCH405 Graduate Architecture Design Studio II (6 Credits)
Architectural design studio with emphasis on building and facade typologies, the development of architectural promenade and sequence, public and/or civic infill buildings dependent upon the architectural promenade, and urban housing types of varying densities. The architect's obligations to urban context are explored in many dimensions including historical, typological, and physical. Offered spring only.
Prerequisite: Minimum grade of B- in ARCH404.
Restriction: Must be in Architecture (Master's) program.

ARCH406 Graduate Architecture Design Studio III (6 Credits)
Investigations into the relationship between the man-made and the natural world including introductory issues of assembly and material value. Design of the site and the building are combined into an integral process delimiting and probing the boundaries of each and exploring their reciprocal relationship. The architect's obligations to the natural and urban contexts are explored in many dimensions including historical, typological, environmental, and physical.
Prerequisite: Minimum grade of B- in ARCH405.
Restriction: Must be in Architecture (Master's) program.

ARCH407 Graduate Architecture Design IV (6 Credits)
Studio problems and theories concentrating on urbanism and urban design techniques. Issues and sites range from high-density urban in-fill to suburban and greenfield development in American and other contexts. Studio theories explore such topics as Contextualism, Neo-Traditional design, Transit Oriented Development, density, sustainable development, building typology, and street design.
Prerequisite: Minimum grade of B- in ARCH406.
Corequisite: ARCH654.
Restriction: Must be in Architecture (Master's) program.

ARCH408 Special Topics Architecture Design Studio (6 Credits)
Design Studio course to examine topical problems in architecture and urban design.
Prerequisite: ARCH400; or permission of ARCH-Architecture Program.
Restriction: Must be in a major in ARCH-Architecture Program; and permission of ARCH-Architecture Program.
Repeatable to: 12 credits if content differs.

ARCH418 Selected Topics in Architectural Technology (3 Credits)
Selected Topics in Architectural Technology
Restriction: Permission of ARCH-Architecture Program.
Repeatable to: 6 credits if content differs.

ARCH419 Independent Studies in Architectural Technology (1-4 Credits)
Proposed work must have a faculty sponsor and receive approval of the Architecture Program Curriculum Committee and Program Director.
Restriction: Permission of ARCH-Architecture Program.
Repeatable to: 6 credits if content differs.

ARCH420 History of American Architecture (3 Credits)
American architecture from the late 17th to the 21st century.
Prerequisite: ARCH225 and ARCH226; or ARCH425 and ARCH426; or permission of the ARCH-Architecture program.

ARCH423 History of Roman Architecture (3 Credits)
Survey of Roman architecture from 500 B.C. To A.D. 325.
Prerequisite: ARCH225 and ARCH226; or ARCH425 and ARCH426; or permission of the ARCH-Architecture Program.

ARCH425 History of Architecture I (3 Credits)
Pre-1500 World Architecture survey course - History of Architecture structured to develop critical thinking and visually literacy with regard to the worldwide legacy of design thinking and cultural production through architecture. Structured to nurture critical thinking and visually literacy with regard to the worldwide legacy of architecture. The work in the course will involve the evaluation of sources and arguments in reading architectural history. Architecture will be framed relative to ways of thinking, religious beliefs, cultural heritage, and cultural values.
Restriction: Permission of ARCH-Architecture Program.
Credit Only Granted for: ARCH225 or ARCH425.
Additional Information: Graduate architecture history course requires additional recitation section and additional coursework tied to survey lectures.

ARCH426 History of Architecture II (3 Credits)
Post-1500 - History of Architecture survey course - History of Architecture structured to develop critical thinking and visually literacy with regard to the worldwide legacy of design thinking and building innovation in architecture. Structured to nurture critical thinking and visually literacy with regard to the worldwide legacy of architecture. The work in the course will involve the evaluation of sources and arguments in reading architectural history. Architecture will be framed relative to ways of thinking, religious beliefs, cultural heritage, and cultural values.
Restriction: Permission of ARCH-Architecture Program.
Credit Only Granted for: ARCH226 or ARCH426.
Additional Information: Graduate architecture history course requires additional recitation section and additional coursework tied to survey lectures.

ARCH427 Theories of Architecture (3 Credits)
Survey of architectural theories - theories of architectural design, representation and urban design from antiquity to the present day.
Prerequisite: ARCH426; or permission of ARCH-Architecture Program.
Restriction: Must be in Architecture (B.S.) program.

ARCH428 Selected Topics in Architectural History (1-4 Credits)
Selected Topics in Architectural History
Prerequisite: ARCH225 and ARCH226; or ARCH425 and ARCH426; or permission of the ARCH-Architecture Program.
Restriction: Permission of ARCH-Architecture Program.
Repeatable to: 6 credits if content differs.

ARCH429 Independent Studies in Architectural History (1-4 Credits)
Proposed work must have a faculty sponsor and receive approval of the Architecture Program Curriculum Committee and Program Director.
Prerequisite: ARCH225 and ARCH226; or ARCH425 and ARCH426; or permission of the ARCH-Architecture Program .
Restriction: Permission of ARCH-Architecture Program.
Repeatable to: 6 credits if content differs.

ARCH430 Measuring Sustainability in Architecture (3 Credits)
Studies metrics of sustainability as included in rating standards, including LEED. All students will take the LEED GA test.
Restriction: Permission of ARCH-Architecture Program.

ARCH435 History of Contemporary Architecture (3 Credits)
Architectural history from World War II to the present.
Prerequisite: ARCH225 and ARCH226; or ARCH425 and ARCH426; or permission of the ARCH-Architecture Program .
Restriction: Permission of ARCH-Architecture Program.

ARCH443 Visual Communication For Architects (3 Credits)
Investigation of the relationship between drawing from life and architectural drawing, the conventions of architectural drawing and the role of architectural drawing as a means to develop, communicate, and generate architectural ideas.
Restriction: Must be in Architecture (Master's) program; and must be in the 3.5 year M. ARCH program.

ARCH445 Visual Analysis of Architecture (3 Credits)
Study of visual principles of architectural and urban precedents through graphic analysis. Exercises include on-site observation, documentation and analysis. Focuses on the development of an architect's sketchbook as a tool for life-long learning.
Prerequisite: ARCH401; or permission of ARCH-Architecture Program.
Jointly offered with: ARCH645.
Restriction: Must be in Architecture (B.S.) program.
Credit Only Granted for: ARCH445 or ARCH645.

ARCH448 Selected Topics in Visual Studies in Architecture (3 Credits)
Selected Topics in Visual Studies in Architecture
Prerequisite: ARCH400.
Restriction: Permission of ARCH-Architecture Program; and must be in a major in ARCH-Architecture Program.
Repeatable to: 6 credits if content differs.

ARCH449 Independent Studies in Visual Studies in Architecture (1-4 Credits)
Proposed work must have a faculty sponsor and receive approval of the Architecture Program Curriculum Committee and Program Director
Restriction: Permission of ARCH-Architecture Program; and must be in a major in ARCH-Architecture Program.
Repeatable to: 6 credits if content differs.

ARCH456 Great Cities (3 Credits)
Case studies from a selection of the great cities of the world.
Prerequisite: Permission of ARCH-Architecture Program.

ARCH458 Selected Topics in Urban Design (3 Credits)
Selected Topics in Urban Design
Restriction: Must be in a major in ARCH-Architecture Program; and permission of ARCH-Architecture Program.
Repeatable to: 6 credits if content differs.

ARCH459 Independent Studies in Urban Design (1-4 Credits)
Proposed work must have a faculty sponsor and receive approval of the Architecture Program Curriculum Committee and Program Director.
Restriction: Must be in a major in ARCH-Architecture Program; and permission of ARCH-Architecture Program.
Repeatable to: 6 credits if content differs.

ARCH460 Site Analysis and Design (3 Credits)
Principles and methods of site analysis; the influence of natural and man-made site factors on site design and architectural form.
Restriction: Must be in the Master of Architecture program; or permission of the School of Architecture, Planning and Preservation.

ARCH461 Sustainability in Architecture (3 Credits)
Strategies of sustainability as related to the broader context of architectural problem solving.
Restriction: Permission of ARCH-Architecture Program.
Credit Only Granted for: ARCH418S or ARCH461.
Formerly: ARCH418S.

ARCH462 Methods & Materials of Building Construction (3 Credits)
Building Construction methods and materials are examined through case studies to explore the means and techniques applied to the material execution of buildings and BIM. Focus on an understanding of the organization of the design and construction process and awareness of building and zoning codes, material systems and types.
Prerequisite: PHYS121 or equivalent; and MATH120 or MATH140 or equivalent; or permission of the ARCH-Architecture Program.
Restriction: Must be in a major in undergraduate or graduate ARCH program or Construction Project Management Minor.
Credit Only Granted for: ARCH410 or ARCH462.

ARCH463 Sustainable Systems in Architecture (3 Credits)
Sustainable systems in architecture examines the nature of the global problem, environmental economics, understanding the local environment, bioclimatic design, solar control and shading, solar access zoning, residential scale energy design issues, commercial scale energy design issues, and urban scale energy design issues.
Prerequisite: ARCH462.
Restriction: Must be in a major in undergraduate or graduate ARCH program.

ARCH464 Architectural Structures I (3 Credits)
This course covers the basic principles of architectural structures, including the influence of geometric, sectional, and material properties related to flexure and shear in beam and framed systems; vector mechanics with application to analysis of trusses, catenaries, and arches; diagrammatic analysis of beams for bending moment, shear, and deflection as well as the study of structural framing systems for vertical and lateral loads.
Prerequisite: ARCH462, ARCH463, and PHYS121; and MATH120 or MATH140, or equivalent; or permission of the ARCH-Architecture Program.
Corequisite: ARCH401 or ARCH406.
Restriction: Must be in either BS in Architecture or M.Architecture Program.
Credit Only Granted for: ARCH411 or ARCH464.

ARCH465 Architectural Structures II (3 Credits)
The basic principles of elastic behavior for different materials such as wood, steel, concrete, and composite materials and compares the properties and applications of materials generally will be covered. It investigates cross sectional stress and strain behavior in flexure and in shear, and torsion as well as the stability of beams and columns. The qualitative behavior of combined stresses and fracture in materials is also covered.
Prerequisite: ARCH464 and PHYS121; and MATH120 or MATH140, or equivalent; or permission of the ARCH-Architecture Program.
Restriction: Must be in either BS in Architecture or M. Architecture Program.
Credit Only Granted for: ARCH412 or ARCH465.

ARCH466 Environmental Systems in Architecture (3 Credits)
Environmental systems in architecture presents the theory, quantification, and architectural design implications for heating ventilating and air conditioning, water and waste, fire protection, electricity, illumination, acoustics, and vertical transportation.
Prerequisite: ARCH462 and ARCH463.
Corequisite: ARCH403 or ARCH406.
Restriction: Must be in either BS in Architecture or M. Architecture Program.
Credit Only Granted for: ARCH413 or ARCH466.

ARCH467 Integrated Project Delivery (3 Credits)
Integrated Project Delivery is examined from design to implementation through an exploration of building construction, architectural design and construction management perspectives.
Restriction: Must be in a major in ARCH-Architecture Program; or must be in Construction Project Management Minor.

ARCH468 Selected Topics in Architecture (1-4 Credits)
Selected Topics in Architecture
Prerequisite: ARCH400; or permission of ARCH-Architecture Program.
Restriction: Permission of ARCH-Architecture Program.
Repeatable to: 6 credits if content differs.

ARCH470 Computer Applications in Architecture (3 Credits)
Introduction to computer utilization, with emphasis on architectural applications.
Prerequisite: ARCH400; or permission of ARCH-Architecture Program.

ARCH472 Building Information Modeling Communication and Collaboration (3 Credits)
Building Information Modeling is explored as pertains to collaboration and communication in the design and construction of buildings and building systems. Practical and empirical learning using BIM software and case studies of real world projects and construction scenarios.
Prerequisite: ARCH400; or permission of ARCH-Architecture Program.
Restriction: Must be in a major in ARCH-Architecture Program; or must be in the Construction Project Management Minor.

ARCH478 Selected Topics in Architecture (1-4 Credits)
Selected Topics in Architecture
Prerequisite: ARCH400; or permission of ARCH-Architecture Program.
Restriction: Permission of ARCH-Architecture Program.
Repeatable to: 6 credits if content differs.

ARCH479 Independent Studies in Architecture (1-4 Credits)
Proposed work must have a faculty sponsor and receive approval of the Architecture Program Curriculum Committee and Program Director
Restriction: Permission of ARCH-Architecture Program.
Repeatable to: 6 credits if content differs.

ARCH481 The Architect in Archaeology (3 Credits)
The role of the architect in field archaeology and the analysis of excavating, recording, and publishing selected archaeological expeditions.
Prerequisite: ARCH225 and ARCH226; or ARCH425 and ARCH426; or permission of the ARCH-Architecture Program.

ARCH482 The Archaeology of Roman and Byzantine Palestine (3 Credits)
Archaeological sites in Palestine (Israel and Jordan) from the reign of Herod the Great to the Moslem conquest.
Prerequisite: ARCH225 and ARCH226; or ARCH425 and ARCH426; or permission of the ARCH-Architecture Program.

ARCH483 Field Archaeology (3 Credits)
Participation in field archaeology with an excavation officially recognized by proper authorities of local government.
Prerequisite: ARCH225 and ARCH226; or ARCH425 and ARCH426; or permission of the ARCH-Architecture Program.

ARCH488 Selected Topics in Architectural Preservation (1-4 Credits)
Selected Topics in Architectural Preservation.
Prerequisite: ARCH400; or permission of ARCH-Architecture Program.
Restriction: Permission of ARCH-Architecture Program.
Repeatable to: 6 credits if content differs.

ARCH489 Independent Studies in Architectural Preservation (1-4 Credits)
Proposed work must have a faculty sponsor and receive approval of the Architecture Program Curriculum Committee and Program Director
Restriction: Permission of ARCH-Architecture Program.
Repeatable to: 6 credits if content differs.

ARCH600 Integrated Design Studio V (6 Credits)
Integrated and comprehensive building and site design. Course content bridges the gap between design and technology, between practice and education, in a studio setting. Explorations include the integration of conceptual and technical aspects of architectural form and assembly, highlighting the ways in which multiple layers of a building design are developed, coordinated and resolved.
Corequisite: ARCH611.
Restriction: Permission of ARCH-Architecture Program.

ARCH601 Topical Design Studio VI (6 Credits)
Topical architectural design studio with concentration on advanced topical inquiry addressing but not limited to: architectural competitions, sustainable design, theoretica/conceptual issues, programmatic, contextual, and/or technical issues.
Prerequisite: Minimum grade of B- in ARCH600.
Restriction: Permission of ARCH-Architecture Program.

ARCH608 Advance Special Topics Design Studio (6 Credits)
Topical architectural design studio with concentration on advanced theoretical, conceptual, technological, cultural or professional issue.
Restriction: Permission of ARCH-Architecture Program.
Repeatable to: 12 credits if content differs.
Additional Information: Elective Architecture Design Studio that may be taken for repeat or advanced credit in place of ARCH404, ARCH405, ARCH406, ARCH407, ARCH600, ARCH601, ARCH700 or an additional design studio.

ARCH611 Advanced Architecture Technology Seminar (3 Credits)
Technology in design of buildings. Application of technological issues in building design; integration of technology in architecture; technology as a form determinant in architecture; other conceptual and philosophical issues related to the application of technology in the design, construction, and use of buildings.
Corequisite: ARCH600.
Restriction: Permission of ARCH-Architecture Program.

ARCH618 Selected Topics in Architectural Technology (3 Credits)
Selected Topics in Architectural Technology
Restriction: Permission of ARCH-Architecture Program.
Repeatable to: 12 credits if content differs.

ARCH628 Selected Topics in Architectural History (1-4 Credits)
Graduate Selected Topics in Architectural History
Prerequisite: ARCH225 and ARCH226; or ARCH425 and ARCH426; or permission of the ARCH-Architecture Program.
Restriction: Permission of ARCH-Architecture Program.
Repeatable to: 6 credits if content differs.

ARCH629 Graduate Independent Studies in Architectural History (1-4 Credits)
Proposed work must have a faculty sponsor and receive approval of the Architecture Program Curriculum Committee and Program Director
Prerequisite: ARCH225 and ARCH226; or ARCH425 and ARCH426; or permission of the ARCH-Architecture Program .
Restriction: Permission of ARCH-Architecture Program.
Repeatable to: 6 credits if content differs.

ARCH635 Seminar in the History of Modern Architecture (3 Credits)
Advanced investigation of historical problems in modern architecture.
Prerequisite: ARCH225 and ARCH226; or ARCH425 and ARCH426; or permission of the ARCH-Architecture Program .
Restriction: Permission of ARCH-Architecture Program.

ARCH648 Selected Topics in Visual Studies for Architects (3 Credits)
Selected topics in visual studies in architecture.
Restriction: Must have permission of ARCH-Architecture Program; and must be in the M.Arch Program.
Repeatable to: 18 credits if content differs.

ARCH654 Urban Development and Design Theory (3 Credits)
Advanced investigation into the history, and practice of urban design, planning, and development.
Prerequisite: ARCH225 and ARCH226; or ARCH425 and ARCH426; or permission of the ARCH-Architecture Program.
Restriction: Permission of ARCH-Architecture Program.

ARCH655 Urban Design Seminar (3 Credits)
Advanced investigation into problems of analysis and evaluation of the design of urban areas, spaces, and complexes with emphasis on physical and social considerations; effects of public policies through case studies. Field observations.
Prerequisite: ARCH654; or permission of ARCH-Architecture Program.
Restriction: Permission of ARCH-Architecture Program.

ARCH658 Selected Topics in Urban Design (3 Credits)
Selected Topics in Urban Design
Restriction: Must be in a major in ARCH-Architecture Program; and permission of ARCH-Architecture Program.
Repeatable to: 6 credits if content differs.

ARCH668 Advanced Selected Topics in Architecture (1-4 Credits)
Graduate Selected Topics in Architecture.
Restriction: Permission of ARCH-Architecture Program.
Repeatable to: 6 credits if content differs.

ARCH670 Advanced Computer Applications in Architecture (3 Credits)
Advanced use of computer technology in design. Use of digital design processes and conceptual methodologies to study design alternatives and realization. Methods and techniques of digital design representation, simulation, or fabrication to explore and test concepts and integration of digital technologies into the architectural design process.
Restriction: Permission of ARCH-Architecture Program.
Credit Only Granted for: ARCH678C or ARCH670.
Formerly: ARCH678C.

ARCH673 Building Culture Seminar (3 Credits)
Comprehension of major themes in the development of architectural building techniques and culture value systems in architecture are developed through lecture, discussion and analysis of seminal readings and buildings.
Restriction: Permission of ARCH-Architecture Program.

ARCH678 Advanced Selected Topics in Architecture (1-4 Credits)
Graduate Selected Topics in Architecture.
Restriction: Permission of ARCH-Architecture Program.
Repeatable to: 6 credits if content differs.

ARCH679 Advanced Independent Studies in Architecture (1-4 Credits)
Proposed work must have a faculty sponsor and receive approval of the Architecture Program Curriculum Committee and Program Chair.
Restriction: Permission of ARCH-Architecture Program.
Repeatable to: 6 credits if content differs.

ARCH688 Advanced Selected Topics in Architectural Technologies (1-4 Credits)
Graduate Selected Topics in Architectural Technologies.
Restriction: Permission of ARCH-Architecture Program.
Repeatable to: 6 credits if content differs.

ARCH689 Advanced Independent Studies in Architectural Technologies (1-4 Credits)
Proposed work must have a faculty sponsor and receive approval of the Architecture Program Curriculum Committee and Program Director.
Restriction: Permission of ARCH-Architecture Program.
Repeatable to: 6 credits if content differs.

ARCH700 Urban Design Studio VII (6 Credits)
Studio problems and theories concentrating on urbanism and urban design techniques. Issues and sites range from high density urban in-fill to suburban and greenfield development in American and other contexts. Studio theories explore such topics as Contextualism, Neo-Traditional design, Transit-Oriented Development, density, sustainable development building typology, and street design.
Prerequisite: Minimum grade of B- in ARCH601 and ARCH654; or permission of Architecture program.
Restriction: Permission of ARCH-Architecture Program.

ARCH770 Professional Practice of Architecture (3 Credits)
Project management, organizational, legal, economic and ethical aspects of architecture.
Restriction: Permission of ARCH-Architecture Program.

ARCH778 Graduate Selected Topics in Urban Design (1-4 Credits)
Graduate Selected Topics in Urban Design.
Restriction: Permission of ARCH-Architecture Program.
Repeatable to: 6 credits if content differs.

ARCH779 Advanced Independent Studies in Urban Design (1-4 Credits)
Proposed work must have a faculty sponsor and receive approval of the Architecture Program Curriculum Committee and Program Director.
Restriction: Permission of ARCH-Architecture Program.
Repeatable to: 6 credits if content differs.

ARCH797 Thesis Proseminar (3 Credits)
Directed research and preparation of thesis program.
Prerequisite: Minimum grade of B- in ARCH601.
Restriction: Must have permission of the ARCH program.

ARCH798 Thesis in Architecture (3 Credits)
Complements the research of ARCH 799, with presentation of the design research to student's thesis committee.
Prerequisite: ARCH797.
Corequisite: ARCH799.
Restriction: Must be in Architecture (Master's) program; and permission of ARCH-Architecture Program; and minimum cumulative GPA of 3.0.

ARCH799 Master's Thesis Research (1-6 Credits)
Development of master's thesis.
Prerequisite: ARCH797.
Corequisite: ARCH798.
Restriction: Must be in Architecture (Master's) program; and permission of ARCH-Architecture Program; and minimum cumulative GPA of 3.0.
Repeatable to: 6 credits if content differs.

AREC - Agricultural and Resource Economics

AREC405 Economics of Production (3 Credits)
The use and application of production economics in analysis of firm and policy decisions. Production functions, cost functions, multiple product and joint production, and production processes through time.
Prerequisite: ECON326 or AREC326; or students who have taken courses with comparable content may contact the department.

AREC422 Econometric Analysis in Agricultural and Environmental Economics (3 Credits)
This course offers a hands-on introduction to econometrics. Students will explore the linear regression model from the ground up by analyzing real-world datasets and learning how to distinguish causation from correlation. They will gain practical experience using econometrics to address important questions in agricultural economics and environmental economics.
Prerequisite: 1 course from (AREC326 or ECON326); and 1 course from (ECON230, ECON321, or BMGT230).
Credit Only Granted for: ECON422, ECON424, or AREC422.

AREC426 Economic Methods and Food Consumption Policy (3 Credits)
An overview of major econometric tools used by policy makers, economists and social scientists to analyze the effects of food consumption policy. Major food assistance programs in the United States such as SNAP, the School Lunch Program and the School Breakfast Program will be discussed.
Prerequisite: AREC326; or ECON326.
Credit Only Granted for: AREC489O or AREC426.
Formerly: AREC489O.

AREC427 Commodity Pricing and Markets (3 Credits)
Economic theory as applied to the marketing of agricultural commodities. How commodity prices vary with current demand and production, and how prices are linked over time, across space, and across grades.
The role played by contractual arrangements, cooperative marketing, vertical integration, and governmental policies in commodity marketing strategies.
Prerequisite: ECON326 or AREC326; or students who have taken courses with comparable content may contact the department.

AREC430 Introduction to Agricultural and Resource Law (3 Credits)
Survey of law with emphasis on problems and applications related to agricultural and natural resource economics. The course emphasizes strategies for managing legal risk arising from ownership, management, and use of agricultural resources. Students will get practical information to utilize in personal or professional settings. Contract law, constitutional law, tort law, property law, real estate transactions, business organization, estate planning, and debtor.
Prerequisite: ECON326 or AREC326.
Credit Only Granted for: AREC430 or AREC489K.
Formerly: AREC489K.

AREC431 Agricultural Water Quality: Policy and Legal Issues (3 Credits)
An overview of the American and Maryland legal systems and sources of legal information as it pertains to water quality and agriculture.
Prerequisite: AREC326; or ECON326; or students who have taken courses with comparable content may contact the department.
Credit Only Granted for: AREC489L or AREC431.
Formerly: AREC489L.

AREC433 Food and Agricultural Policy (3 Credits)
Economic and political context of governmental involvement in the farm and food sector. Historical programs and current policy issues. Analysis of economic effects of agricultural programs, their benefits and costs, and comparison of policy alternatives. Analyzes the interrelationship among international development, agricultural trade and general economic and domestic agricultural policies.
Prerequisite: ECON326 or AREC326; or students who have taken courses with comparable content may contact the department.

AREC435 Commodity Futures and Options (3 Credits)
The economics and institutional features of commodity futures and options markets. Students will develop a basic understanding of the underlying price relationships between cash and futures markets and will apply this information to business risk management decision making.
Prerequisite: AREC326; or ECON326; or students who have taken courses with comparable content may contact the department.

AREC445 Agricultural Development, Population Growth and the Environment (3 Credits)
Development theories, the role of agriculture in economic development, the agricultural policy environment, policies impacting on rural income and equity, environmental impacts of agricultural development.
Prerequisite: ECON326 or AREC326; or students who have taken courses with comparable content may contact the department.

AREC446 Sustainable Economic Development (3 Credits)
Examine why socially equitable and environmentally sustainable economic growth is difficult to achieve. It explores the interactive dynamics of environmental degradation, human capital, inequality and institutions. Emphasis is on the role of market imperfections and political failure in explaining the persistence of extractive economic institutions that hinder sustainable development.
Prerequisite: AREC326; or ECON326; or students who have taken courses with comparable content may contact the department.
Credit Only Granted for: AREC446 or AREC489G.
Formerly: AREC489G.

AREC447 The Economy of China (3 Credits)
An introductory survey course of economic development in China with emphasis on understanding the process of economic reform in mainland China since 1978.
Prerequisite: AREC326, ECON306, or ECON326.

AREC453 Natural Resources and Public Policy (3 Credits)
Rational use and reuse of natural resources. Theory, methodology, and policies concerned with the allocation of natural resources among alternative uses. Optimum state of conservation, market failure, safe minimum standard, and cost-benefit analysis.
Prerequisite: AREC326, ECON306, or ECON326; and (BMGT230 or ECON230).
Cross-listed with: ECON453.
Restriction: Must be in one of the following programs (Agricultural and Resource Economics; Agricultural and Resource Economics: Agribusiness; Agricultural and Resource Economics: Environmental and Resource Economics; Economics Bachelor of Arts; Environmental Science & Policy-Env Economics; Social Data Science-Economics; Economics minor).
Credit Only Granted for: AREC453 or ECON453.

AREC454 The Economics of Climate Change (3 Credits)
The role of economics in the formation of climate policy; basic concepts of environmental economics including efficiency, externalities, and policy instruments; economic models of intertemporal decisions and decision making in the face of uncertainty. Applied economic analysis of specific issues and current policy initiatives.
Prerequisite: 1 course with a minimum grade of C- from (AREC326, ECON306, ECON326); and 1 course with a minimum grade of C- from (ECON230, ECON321, BMGT230).
Cross-listed with: ECON484.
Credit Only Granted for: AREC454 or ECON484.

AREC455 Economics of Land Use (3 Credits)
Fundamentals of location theory. Microeconomics of land use decisions, including determination of rent and hedonic pricing models. Impacts of government decisions on land use, including regulation (e.g., zoning), incentives (transferable development rights), provision of public services, and infrastructure investments. Impacts of land use on environmental quality, including issues relating to sprawl, agricultural land preservation, and other topics of special interest.
Prerequisite: 1 course with a minimum grade of C- from (AREC326, ECON306, ECON326); and 1 course with a minimum grade of C- from (ECON230, ECON321, BMGT230).
Cross-listed with: ECON485.
Credit Only Granted for: AREC455 or ECON485.

AREC456 Energy and Environmental Economics (3 Credits)
Economic theory and empirical methods are used to study problems of energy, the environment, and the economy. It examines the extraction, production, and use of energy and market institutions and regulatory approaches used to correct market failures. Topics covered include: oil and natural gas markets, management and design of electricity markets, renewable energy, non-market valuation , climate change, and transportation policies.
Prerequisite: 1 course with a minimum grade of C- from (AREC326, ECON306, ECON326); and 1 course with a minimum grade of C- from (ECON230, ECON321, BMGT230).
Cross-listed with: ECON486.
Credit Only Granted for: AREC456 or ECON486.

AREC466 Transportation Engineering, Economics, and Policy (3 Credits)
The transportation system moves people and goods around the world, but transportation has downsides: harming local air quality, contributing to climate change, causing traffic accidents, and wasting people's time on congested roads. Mitigating these downsides will require new policies, new technologies, and new decisions by households and businesses. Focusing on the US transportation system, students will apply an integrated economics, policy, and engineering perspective to analyze transportation's most pressing challenges. Students are expected to have some background in one of the three disciplines--economics, engineering, or policy--but not all three. The beginning of the semester will include tutorials for students without much economics or engineering background.
Prerequisite: BMGT230, ECON230, ECON321, ENCE302, or PLCY304; or permission of the instructors.
Recommended: AREC326, ECON306 or ECON326.
Credit Only Granted for: AREC466 or ENCE489T.

AREC481 Environmental Economics (3 Credits)
An exploration of the use of economic incentives for protection of the environment and the determination of appropriate (or efficient) level of environmental quality. Also covers the choice of policy instruments for the attainment of environmental standards.
Prerequisite: 1 course with a minimum grade of C- from (AREC326, ECON306, ECON326); and 1 course with a minimum grade of C- from (ECON230, ECON321, BMGT230).
Cross-listed with: ECON481.
Restriction: Must be in one of the following programs (Agricultural and Resource Economics; Agricultural and Resource Economics: Agribusiness; Agricultural and Resource Economics: Environmental and Resource Economics; Economics Bachelor of Arts; Environmental Science & Policy-Env Economics; Social Data Science-Economics; Economics minor).
Credit Only Granted for: ECON481 or AREC481.

AREC489 Special Topics in Agricultural and Resources Economics (3 Credits)
Repeatable to: 9 credits.

AREC499 Honors Thesis Research (3-6 Credits)
Undergraduate honors thesis research conducted under the direction of an AGNR faculty member in partial fulfillment of the requirements of the College of AGNR Honors Program. The thesis will be defended to a faculty committee.
Restriction: Must be in the AGNR Honors program.
Repeatable to: 6 credits if content differs.

AREC610 Microeconomic Applications in Agricultural and Resource Markets (3 Credits)
Applications of graduate level microeconomic analysis to the problems of agricultural and natural resource production and distribution including demand for agricultural output, the nature of agricultural supply decisions, decision making under uncertainty, valuation of natural resources, and exploitation of natural resources.
Prerequisite: ECON603 and AREC620.

AREC620 Optimization in Agricultural and Resource Economics (3 Credits)
Mathematical theory of static and dynamic optimization as applied to the economics of agriculture, natural resources and the environment. Topics include necessary and sufficient conditions for constrained optimization, convexity and concavity, duality and the envelope theorem, comparative statics, fixed point theorems, optimal control theory and dynamic programming.
Prerequisite: Must have completed Multivariate calculus and matrix or linear algebra.

AREC623 Applied Econometrics I (4 Credits)
A modern introduction to empirical strategies in applied microeconomic research in public policy, development economics, labor economics, education, marketing and corporate finance. Emphasis on causal reasoning and design-driven identification in the social sciences. Concepts and applications will focus on addressing economically meaningful causal questions. Basic theoretical and mathematical aspects of probability and statistics will be developed to assess the significance of the relationship among economic variables. Topics include: the approximation of the conditional expectation function through a linear predictor (Ordinary Least Squares), the effects of omitted variables and the usefulness of variables that resemble the outcome of a randomized experiment (Instrumental Variables), as well as extensions to high-dimensional big-data counterparts. Fundamental concepts in sampling theory, statistical inference (with small and large samples) and hypothesis testing will be studied and applied to real data using Stata, a general-purpose statistical software.
Prerequisite: Introductory statistics or econometrics, linear algebra, and differential/calculus; or permission of instructor.
Additional Information: Intended for first-year Ph.D. students from AREC, BUFN, ECON, EDMS, EDUC, PLCY and URSP departments with a background in introductory statistics or econometrics.

AREC624 Applied Econometrics II (4 Credits)
Variations of the standard linear model, simultaneous equations estimation, nonlinear regression, nonlinear simultaneous equations estimation, static and dynamic panel data models, errors in variables, Hausman tests, discrete choice models such as conditional multinomial and mixed logit models, latent class models, semi-parametric estimation, varying parameter models, unobserved variables, time series models, and model selection procedures.
Prerequisite: AREC623.

AREC699 Special Problems in Agricultural and Resource Economics (1-2 Credits)
Intensive study and analysis of specific problems in the field of agricultural and resource economics, providing in-depth information in areas of special interest to the student.

AREC783 Environmental Taxation and Regulation (3 Credits)
The economics of policies to address environmental externalities. Specific topics include the theory of public goods and externalities, cost-benefit and cost-effectiveness analysis of environmental regulations, regulatory instrument choice under uncertainty, environmental policy in an economy with pre-existing tax distortions, monitoring and enforcement of environmental regulations, distributional effects of environmental policy, and regulation of intertemporal externalities.
Prerequisite: ECON603 and ECON604; and graduate-level econometrics.
Credit Only Granted for: AREC783 or AREC869W.
Formerly: AREC869W.

AREC784 Energy Economics, Empirical Industrial Organization, and Public Policy (3 Credits)
Energy markets and public policy, evaluating techniques for estimating market demand and supply and for evaluating policy intervention. Comparison of reduced-form and structural approaches. Applications may include but are not limited to electricity, oil and other liquid fuels, and household travel, with examples from the United States and other countries.
Prerequisite: ECON603, AREC623, and AREC624; or permission of instructor.

AREC785 Advanced Economics of Natural Resources (3 Credits)
The use of exhaustible and renewable natural resources from normative and positive points of view. Analysis of dynamic resource problems emphasizing energy, mineral, groundwater, forestry, and fishery resources; optimal, equilibrium, and intergenerational models of resource allocation.
Prerequisite: Permission of AGNR-Agricultural & Resource Economics department; or (ECON603 and AREC623).
Cross-listed with: ECON785.
Credit Only Granted for: AREC785 or ECON785.

AREC799 Master's Thesis Research (1-6 Credits)

AREC815 Experimental and Behavioral Economics (3 Credits)
An overview of the design, implementation, and analysis of experiments motivated by behavioral economics, with a particular focus on experiments in field settings. Topics covered include social preferences, risk aversion, prospect theory, present bias, overconfidence, and limited attention.
Prerequisite: AREC623, AREC624, ECON603, and ECON604; or equivalent.
Credit Only Granted for: AREC815 or AREC869A.
Formerly: AREC869A.

AREC829 Policy Design and Causal Inference for Social Science (3 Credits)
A course in applied econometrics that examines empirical strategies in applied microeconomic research used to estimate the effects of a policy or program on the outcomes of interest in fields like public policy, development economics, labor economics, education, marketing and corporate finance, as well as in industry and international organizations. Methods in applied econometrics with a focus on the thought experiment, the hypothetical experiment that should be used to answer the causal question of interest. A taxonomy of departures from the experimental ideal is presented, as well as the assumptions required to mimic the conditions of the unfeasible experiment from observational data. Topics include regression and matching, instrumental variables and natural experiments, differences-in-differences, change-in-changes, synthetic control methods and regression discontinuity designs. Causal parameters defined from conditional moments, and quantiles and effects on conditional distributions (for inequality and poverty assessment) are considered. Stata, a general-purpose statistical software widely used by applied economists, is used to develop concepts and applications.
Prerequisite: AREC623; or permission of instructor.
Repeatable to: 9 credits if content differs.
Additional Information: The course is intended for second-year Ph.D. students from AREC, BUFN, ECON, EDMS, EDUC, PLCY and URSP who have a background in quantitative methods comparable to that offered in an introductory micro-econometrics class.

AREC832 Agricultural Policy Analysis (3 Credits)
The economics of agricultural policies. The impact of agricultural policies on both historic and modern growth, including discussion of optimal farm and ownership structure. Contemporary policy issues in both developed and developing countries. Additional topics in trade, environment, and commodity markets.
Credit Only Granted for: AREC632 or AREC832.

AREC844 Firm Growth in Developing Countries (3 Credits)
A study of the growth of firms face in developing countries and interventions/policies that can be used to remove barriers to growth, including issues related to management, credit constraints, political connections, misallocation and trade.
Prerequisite: A one-year PhD-level sequence in microeconomics and a PhD-level course in econometrics.

AREC845 Environment and Development Economics (3 Credits)
Considers neoclassical and endogenous growth models; international trade theory; the role of property right institutions and factor markets; the environmental impact of trade liberalization in developing countries and the environmental effects of increasing international capital mobility; empirical studies relating the environment to growth and globalization; and policy analyses.

AREC847 Networks, Social Learning and Technology Adoption (3 Credits)
This class will focus on networks, learning from others, and peer effects and the role ofeach in human capital accumulation, technology adoption and behavior. The material isfocused on applications of education, health agriculture and entrepreneurship in developingcountries, but will draw heavily from literatures on these effects in developed countries aswell. The class will cover the theory of networks and learning but its primary focus will beon the empirical difficulty of identifying these effects and establishing causality.
Prerequisite: AREC624, AREC623, and ECON603; and students who have taken courses with comparable content may contact the department.

AREC869 Advanced Topics in Agricultural and Resource Economics (1-3 Credits)
Frontiers of research in environmental and resource economics; agricultural policy, production, and trade; and development. Topics may include decision making under risk and related market institutions, principal agent analysis, optimal policy design, technology adoption, market structure, land and credit markets, information markets, and income distribution.
Repeatable to: 9 credits if content differs.

AREC891 Introduction to Prospectus Development (1 Credit)
Critical evaluation of research, prospectus topic exploration including literature review, data identification, model development, and related presentations. Required of all second-year Ph.D. students.
Prerequisite: Completion of the first year of graduate study in AREC.
Credit Only Granted for: AREC 869K or AREC 891.
Formerly: AREC869K.

AREC892 Dissertation Prospectus Development (3 Credits)
Presentations of proposed dissertation research including literature review, model development, data identification, and written prospectus development. Required of all third-year Ph.D. students.
Prerequisite: Completion of two years of the AREC Ph.D. program.
Credit Only Granted for: AREC 869P or AREC 892.
Formerly: AREC869P.

AREC898 Pre-Candidacy Research (1-8 Credits)

AREC899 Doctoral Dissertation Research (1-8 Credits)

ARHU - Arts and Humanities

ARHU439 Interdisciplinary Studies in Arts and Humanities (3 Credits)
An interdisciplinary exploration of chronological, geographical or thematic topics in Arts and Humanities.
Repeatable to: 6 credits if content differs.

ARHU440 Arts Leadership Seminar (3 Credits)
An advanced seminar that connects arts leadership to current trends in technology, demographics, policy, and the economy. Through an investigation of current events, leadership theory, and case studies and guest speakers from the field, students will evaluate arts leadership as a profession and develop their own unique leadership identity. Topics included strategic management, organizational culture, ethics, decision making, and partnerships.
Prerequisite: ARHU240; or permission of instructor.
Cross-listed with: TDPS440.
Credit Only Granted for: ARHU440 or TDPS440.

ARHU441 Arts Entrepreneurship: Theory and Practice (3 Credits)
Establishes arts entrepreneurship as a unique discipline with the goal of connecting creative initiatives (products, artforms, and programs) to audiences, resources, and communities. Introduces students to the ways in which creative initiatives both create value and offer solutions to social, political, environmental, and cultural issues. Students will develop artist impact statements and identify different contexts and ways to apply their talents and creative initiatives in society.
Prerequisite: ARHU240 or TDPS240; or permission of instructor.
Recommended: ARHU440 or TDPS440.
Cross-listed with: TDPS441.
Jointly offered with: ARHU640, TDPS640.
Restriction: Limited to 4 undergraduate students (2 in ARHU and 2 in TDPS).
Credit Only Granted for: TDPS458E, ARHU441, TDPS441, ARHU640 or TDSP640.
Formerly: TDPS458E.

ARHU458 Graduate School Preparation (1 Credit)
Designed for Juniors and Seniors in the College of Arts and Humanities who are interested in applying to graduate school. Topics include skills needed for the graduate school search and application process, evaluation and reflection of application materials, interview and essay preparation, and exploration into career options after graduate school. Focus is on the Arts and Humanities fields, and is not necessarily intended for students planning on attending professional school (law school, medical school, etc.). The course is also not intended for students who are already participating in a Plus-1 program.
Restriction: Must have earned a minimum of 60 credits; must be in a major in the College of Arts and Humanities.
Repeatable to: 3 credits if content differs.

ARHU468 Peer Mentoring Program (1 Credit)
A workshop for sophomore, junior or senior students who wish to serve as peer mentors helping first-year students to cope with the numerous issues which often arise in the transition to the university.
Restriction: Sophomore standing or higher; and permission of ARHU-College of Arts & Humanities.
Repeatable to: 6 credits if content differs.

ARHU486 Internship Practicum in Arts and Humanities (3-6 Credits)
An internship intended for students who have already completed an internship for credit. ARHU486 must be a different experience from the internship students have already taken for credit. Generally students intern with a different company, but they may continue working for the same company if the job is significantly different. See ARHU internship coordinator for details.
Prerequisite: Have completed previous internship at U of MD.
Restriction: Must be in a major in ARHU-College of Arts & Humanities; and permission of ARHU-College of Arts & Humanities; and minimum cumulative GPA of 2.5; and must have earned a minimum of 60 credits; and completed 12 credits at U of MD.

ARHU489 Advanced Internship Practicum in ARHU (3-6 Credits)
Designed for students who have already completed at least 2 upper level internship courses for academic credit. It is an advanced practicum to assist students in continuing to develop and hone their professional writing, presentation and analytical skills.
Prerequisite: ARHU486.
Restriction: Must be in a major in ARHU-College of Arts & Humanities; and minimum cumulative GPA of 2.5; and permission of instructor.
Repeatable to: 6 credits if content differs.
Additional Information: Course is designed to follow ARHU486.

ARHU498 Special Topics in Arts and Humanities (3 Credits)
Repeatable to: 6 credits if content differs.

ARHU640 Arts Entrepreneurship: Theory and Practice (3 Credits)
Establishes arts entrepreneurship as a unique discipline with the goal of connecting creative initiatives (products, artforms, and programs) to audiences, resources, and communities. Introduces students to the ways in which creative initiatives both create value and offer solutions to social, political, environmental, and cultural issues. Students will develop artist impact statements and identify different contexts and ways to apply their talents and creative initiatives in society.
Cross-listed with: TDPS640.
Credit Only Granted for: ARHU640, TDPS640, or THET669U.
Formerly: THET669U.

ARHU641 Arts Entrepreneurship Seminar (3 Credits)
Active seminar on special topics of interest delivered through practical application of theoretical and developing knowledge. Utilizes ongoing programs at the Clarice Smith Performing Arts Center as a laboratory for analyzing and contributing to community-based programs through the lens of arts entrepreneurship. Advances students' understanding of and experience with the nuanced and complex work of arts co-creation, citizenship, partnerships, engagement, and impact.
Prerequisite: ARHU640 or TDPS640; or permission of instructor.
Cross-listed with: TDPS641.
Credit Only Granted for: TDPS641 or ARHU641.

ARHU786 Leadership and Professional Development Internship (1-6 Credits)
Professional development for graduate students interested in careers in non-academic organizations and in administrative positions in academic institutions. See department graduate program director for internship guidelines and applicability to graduate program requirements.
Prerequisite: Must have completed one semester of full-time graduate study; and permission of ARHU-College of Arts & Humanities.

ARHU788 Profession Development Seminar (1-3 Credits)
Professional development for academic and non-academic careers in the arts and humanities.
Repeatable to: 9 credits if content differs.

ARHU789 Professional Development Practicum (1-6 Credits)
Graduate students, in various disciplines within the college of Arts and Humanities, will learn the theory and principles of a specific issue or skill set related to academic or non-academic work. They will create original work in a hands-on practicum format.
Restriction: Must have completed at least the equivalent of one year of full-time graduate study; and permission of instructor.
Repeatable to: 6 credits if content differs.

ARMY - Army

ARMY401 Advanced Military Leadership III (3 Credits)
Introduces contracted students to the study of Army structure, practices and processes exercised by Army Commanders and Staff in completing personnel, logistics, training and combat operations. Includes a laboratory in applied leadership skills and two field exercises.

ARMY402 Advanced Military Leadership IV (3 Credits)
The military system and code of ethics in the military environment is studied. Topics include code of conduct during all forms of military operations, the Geneva Conventions and the ethical decision making process. Also includes a laboratory in applied leadership skills, fitness excellence and two field exercises.

ARSC - Air Science

ARSC400 National Security and Preparation for Active Duty I (3 Credits)
Study of American national security policy and processes to include information and implementation, impact of major national and international actors, and development of major policy issues. This course will satisfy credit towards a minor in military studies.
Prerequisite: Permission of UGST-AFROTC-Air Science; or (ARSC300 or ARSC301).
Corequisite: ARSC059; or permission of UGST-AFROTC-Air Science.
Restriction: Senior standing.

ARSC401 National Security and Preparation for Active Duty II (3 Credits)
This course examines various subjects including: military law/justice, preparation for active duty, and current issues affecting military professionalism. This course will satisfy credit towards a minor in military studies.
Prerequisite: ARSC300 or ARSC301; or permission of UGST-AFROTC-Air Science.
Corequisite: ARSC059; or permission of UGST-AFROTC-Air Science.
Restriction: Senior standing.

ARTH - Art History & Archaeology

ARTH418 Special Problems in Italian Renaissance Art (3 Credits)
Focus upon aspects of painting, sculpture, and architecture of Renaissance.
Repeatable to: 6 credits if content differs.

ARTH426 Renaissance and Baroque Sculpture in Northern Europe (3 Credits)
Sculpture in France, Germany, England, and the Low Countries from the fourteenth to the seventeenth century.

ARTH472 Ecuador: Andean Spaces-Traversing the Colonial City and the Natural World (3 Credits)
Introduces students to the history and cultures of Ecuador from the colonial period to the beginning of the 19th century. By studying the socio-spatial configuration of the colonial city as exemplified by Quito, students will be immersed in the art, architecture, and other rich cultural legacies of Ecuador. Quito, a World Heritage site, offers students visually stunning churches, monasteries, colonial squares, a famed tradition of Baroque painting and sculptures, and vibrant indigenous and mestizo communities. As a contrast, students will explore also travel narratives that represent the natural Andean world while visiting Quito's surrounding areas. This course will interrogate the European influence on urban design and representations of the landscape of the Americas. Understanding this colonial past enhances the understanding of the modern history of the Andean region and Latin America as a whole. The students will gain a full appreciation of the European and Indigenous living heritage that composes the region today. Taught in English.
Cross-listed with: SPAN435.
Credit Only Granted for: SPAN435, SPAN448E, ARTH472 or ARTH369E.
Formerly: SPAN448E and ARTH369E.

ARTH484 Modern Chinese Film and Visual Culture (3 Credits)
Modern Chinese culture, society, and history studied through examples of art, film, and visual culture.
Cross-listed with: CINE426.
Credit Only Granted for: ARTH484, CINE426 or FILM426.
Formerly: FILM426.

ARTH488 Colloquium in Art History (3 Credits)
Colloquium to investigate a specific topic in depth.
Prerequisite: Permission of ARHU-Art History & Archaeology department.
Repeatable to: 9 credits if content differs.

ARTH489 Special Topics in Art History (3 Credits)
Prerequisite: Permission of ARHU-Art History & Archaeology department.
Repeatable to: 9 credits if content differs.

ARTH498 Directed Studies in Art History I (2-3 Credits)
Prerequisite: Permission of ARHU-Art History & Archaeology department.
Restriction: Junior standing or higher.
Repeatable to: 99 credits if content differs.

ARTH499 Honors Thesis (1-6 Credits)
Prerequisite: Permission of ARHU-Art History & Archaeology department.
Repeatable to: 6 credits if content differs.

ARTH608 Studies in Ancient Art and Archaeology (3 Credits)
Repeatable to: 9 credits.

ARTH609 Studies in Late Roman, Early Christian, and Byzantine Art (3 Credits)
Repeatable to: 9 credits.

ARTH618 Studies in Medieval Art (3 Credits)
Repeatable to: 9 credits.

ARTH619 Studies in Italian Renaissance Art (3 Credits)
Repeatable to: 9 credits.

ARTH628 Studies in Fourteenth and Fifteenth Century Northern European Art (3 Credits)
Repeatable to: 9 credits.

ARTH629 Studies in Sixteenth-Century Northern European Art (3 Credits)
Repeatable to: 9 credits.

ARTH638 Studies in Seventeenth-Century Southern European Art (3 Credits)
Repeatable to: 9 credits.

ARTH639 Studies in Seventeenth-Century Northern European Art (3 Credits)
Repeatable to: 9 credits.

ARTH648 Studies in Eighteenth-Century European Art (3 Credits)
Repeatable to: 9 credits.

ARTH649 Studies in Nineteenth-Century European Art (3 Credits)
Repeatable to: 9 credits.

ARTH658 Studies in American Art (3 Credits)
Repeatable to: 9 credits.

ARTH659 Studies in Twentieth-Century Art (3 Credits)
Repeatable to: 9 credits.

ARTH668 Studies in Latin American Art and Archaeology (3 Credits)
Repeatable to: 9 credits.

ARTH669 Studies in African Art (3 Credits)
Repeatable to: 9 credits.

ARTH678 Studies in Chinese Art (3 Credits)
Repeatable to: 9 credits.

ARTH679 Studies in Japanese Art (3 Credits)
Repeatable to: 9 credits.

ARTH689 Selected Topics in Art History (1-3 Credits)
Repeatable to: 9 credits.

ARTH692 Methods of Art History (3 Credits)
Methods of research and criticism applied to typical art-historical problems; bibliography and other research tools.

ARTH698 Teaching Art History (1-3 Credits)
Allows students to explore pedagogical tools and methods in the history of art and archaeology, with a goal to becoming better instructors in the field. Starting with the basics of being a good TA (discussion of texts, teaching visual analysis, grading assignments), it moves on through questions of research and project-based teaching, lecturing, and the creation of an inclusive and equitable classroom. Students are asked to design a class they could teach, including a syllabus and assignment prompts. They will also learn how to deliver a lecture (in class, at a conference) and will explore the job market (academic and non-academic) for art historians and archaeologists. The class is recommended for students who have served once as a TA and taken the basic "TA Training" workshops.
Repeatable to: 3 credits.

ARTH699 Special Topics in Art History (3 Credits)
Prerequisite: consent of department head or instructor.
Restriction: Permission of instructor; or permission of ARHU-Art History & Archaeology department.

ARTH708 Seminar in Ancient Art and Archaeology (3 Credits)
Repeatable to: 9 credits.

ARTH709 Seminar in Late Roman, Early Christian, and Byzantine Art (3 Credits)
Repeatable to: 9 credits.

ARTH718 Seminar in Medieval Art (3 Credits)
Repeatable to: 9 credits.

ARTH719 Seminar in Italian Renaissance Art (3 Credits)
Repeatable to: 9 credits.

ARTH728 Seminar in Fourteenth and Fifteenth-Century Northern European Art (3 Credits)
Repeatable to: 9 credits.

ARTH729 Seminar in Sixteenth-Century Northern European Art (3 Credits)
Repeatable to: 9 credits.

ARTH738 Seminar in Seventeenth-Century Southern European Art (3 Credits)
Repeatable to: 9 credits.

ARTH739 Seminar in Seventeenth-Century Northern European Art (3 Credits)
Repeatable to: 9 credits.

ARTH748 Seminar in Eighteenth-Century European Art (3 Credits)
Repeatable to: 9 credits.

ARTH749 Seminar in Nineteenth-Century European Art (3 Credits)
Repeatable to: 9 credits.

ARTH758 Seminar in American Art (3 Credits)
Repeatable to: 9 credits.

ARTH759 Seminar in Twentieth-Century Art (3 Credits)
Repeatable to: 9 credits.

ARTH768 Seminar in Latin American Art and Archaeology (3 Credits)
Repeatable to: 9 credits.

ARTH769 Seminar in African Art (3 Credits)
Repeatable to: 9 credits.

ARTH778 Seminar in Chinese Art (3 Credits)
Repeatable to: 9 credits.

ARTH779 Seminar in Japanese Art (3 Credits)
Repeatable to: 9 credits.

ARTH789 Selected Topics in Art History (1-3 Credits)

ARTH798 Directed Graduate Studies in Art History (3 Credits)

ARTH799 Master's Thesis Research (1-6 Credits)

ARTH898 Pre-Candidacy Research (1-8 Credits)

ARTH899 Doctoral Dissertation Research (1-8 Credits)

ARTT - Art Studio

ARTT409 Study Abroad Special Topics IV (1-6 Credits)
Special topics course taken as part of an approved study abroad program.
Repeatable to: 15 credits if content differs.

ARTT418 Advanced Drawing Studio (3 Credits)
Multi-level drawing studio emphasizing advanced concepts and processes related to drawing; emphasis on contemporary art issues and individual directions.
Prerequisite: ARTT200, ARTT210, and ARTT150; and must have completed one 300-level studio course. Or permission of ARHU-Art department.
Repeatable to: 12 credits.

ARTT426 Advanced Painting: Painting on Site I (3 Credits)
Designed for Art and design, architecture, urban planning, and public engagement majors seeking to gain more experience in the public art process. Through public artworks, students will explore ethical methods of community engagement, mural design and production. This course will have 1-2 visiting artists give lectures and/or participate in a workshop.
Prerequisite: ARTT320; or permission of the Art Department.

ARTT427 Advanced Painting: Painting on Site II (3 Credits)
Designed for Art and design, architecture, urban planning, and public engagement majors and Creative Placemaking minors seeking to build and strengthen relationships through public place-based artwork . This course will teach ethical methods of public outreach through community engagement, the stages of mural design, and research to aid the mural design phase. This course will also examine the various materials used to create a public work of art and apply them throughout the semester effectively.
Prerequisite: ARTT320.
Restriction: Permission of the Art Department.

ARTT428 Advanced Painting Studio (3 Credits)
Multi-level painting studio emphasizing advanced concepts and processes related to oil and acrylic painting; emphasis on contemporary art issues and individual directions in chosen media.
Prerequisite: ARTT320.
Repeatable to: 12 credits.

ARTT438 Advanced Sculpture Studio (3 Credits)
Multi-level sculpture studio; continuation of media-specific sculpture courses with emphasis on contemporary art issues and individual directions in chosen media.
Prerequisite: Must have completed one 300-level sculpture course; or permission of ARHU-Art department.
Repeatable to: 12 credits.

ARTT448 Advanced Printmaking Studio (3 Credits)
Multi-level printmaking studio; continuation of media-specific printmaking courses with emphasis on contemporary art issues and individual directions in chosen media.
Prerequisite: Must have one 300-level printmaking course; or permission of ARHU-Art department.
Repeatable to: 12 credits.

ARTT449 Advanced Photography Studio (3 Credits)
Advanced photographic processes and theory. Emphasis on contemporary art issues and individual directions.
Prerequisite: ARTT353; or permission of ARHU-Art department.
Repeatable to: 12 credits if content differs.

ARTT454 Advanced Graphic Design Principles: Design in Society (3 Credits)
Focus on social responsibility and community activism. History and theory of propaganda and advocacy-based design. Students explore current design practices, work individually, and collaborate in teams with non-profits or other clients with community-based or socio-cultural agendas. Research and writing-intensive course.
Prerequisite: ARTT355 and ARTT356.

ARTT455 Three Dimensional Graphic Design (3 Credits)
Continued exploration of advanced graphic design practices with primary emphasis on 3-D object and packaging design. Includes research, course reading discussion, oral presentations, and specific project assignments which will require a proficient level of hand-skills (craft) and computer skills.
Prerequisite: ARTT355, ARTT356, and ARTT357.
Recommended: ARTT333.
Credit Only Granted for: ARTT352 or ARTT455.
Formerly: ARTT352.

ARTT456 Motion Design (3 Credits)
Explores computer graphics and visual communication principles in a time-based context. Examination of fundamental design principles through digital projects that involve photo manipulation, digital illustration, layout, animation, and web design.
Prerequisite: ARTT355, ARTT356, and ARTT357; or permission of ARHU-Art department.

ARTT457 Advanced Interactive Design (3 Credits)
Advanced concepts and techniques of interactive design and interactive software. Examination of corporate, client-based, and public service-based interactive graphic design. Emphasis on web-based interactive design structures.
Prerequisite: ARTT357.

ARTT458 Graphic Design Portfolio (3 Credits)
Creation of a comprehensive professional portfolio. Curriculum includes portfolio preparation and presentation, contracts, copyright issues, interviewing skills, resume and cover-letter writing, design briefs and proposals, and freelance business issues. Portfolio presentation includes basics of book arts.
Prerequisite: ARTT454.
Repeatable to: 9 credits if content differs.

ARTT459 Advanced Graphic Design Studio (3 Credits)
Student-run design firm working with non-profits and other organizations. Organizations act as clients; the students as a creative firm. Under guidance and supervision of faculty, students learn first-hand about working with clients, working within a budget, working with printers and press runs, and working under real deadlines.
Prerequisite: ARTT454; or permission of ARHU-Art department.
Repeatable to: 9 credits if content differs.

ARTT460 Seminar in Art Theory (3 Credits)
Exploration of relationship between content and processes of art in a contemporary multi-cultural context.
Restriction: Senior standing.

ARTT468 Seminar on the Interrelationship Between Art and Art Theory (3 Credits)
The relationship between a student's work and the theoretical context of contemporary art.
Restriction: Junior standing or higher; or permission of ARHU-Art department.
Repeatable to: 6 credits if content differs.

ARTT469 Professional Practice (3 Credits)
Business aspects of being an artist, with an emphasis on starting and maintaining a professional career.
Restriction: Senior standing; or permission of ARHU-Art department.
Repeatable to: 6 credits if content differs.
Formerly: ARTT462.

ARTT479 Advanced Digital Media Studio (3 Credits)
Variable multi-level studio emphasizing advanced concepts and processes related to time-based, projection, installation, interactive, and audio/visual integrated digital art. Emphasis on contemporary art issues and individual directions.
Prerequisite: ARTT370; or permission of ARHU-Art department.
Repeatable to: 12 credits if content differs.

ARTT481 Advanced Specialization Seminar (3 Credits)
Seminar combines contemporary art theory, criticism, professional practice and career preparation in relation to students works from all areas of specialization.
Prerequisite: Permission of ARHU-Art department.

ARTT487 Capstone for Citation in Interdisciplinary Multimedia and Technology (1 Credit)
Independent study: a paper or website synthesizing the various citation learning experiences.
Prerequisite: Permission of ARHU-Art department.

ARTT488 Advanced Special Topics in Graphic Design (1-3 Credits)
Variable topics in Graphic Design theory and practice.
Prerequisite: Permission of ARHU-Art department.
Repeatable to: 6 credits if content differs.

ARTT489 Advanced Special Topics in Art (1-3 Credits)
Advanced studio art and theory within the context of a special topic.
Prerequisite: Permission of ARHU-Art department.
Repeatable to: 12 credits if content differs.

ARTT498 Directed Studies in Studio Art (1-3 Credits)
Advanced independent work in Studio Art. Meeting with faculty and studio time arranged.
Prerequisite: Permission of ARHU-Art department.
Repeatable to: 12 credits if content differs.

ARTT499 Directed Studies in Graphic Design (1-3 Credits)
Advanced independent studies in Graphic Design. Meetings with faculty and studio time arranged.
Prerequisite: Permission of ARHU-Art department.
Repeatable to: 12 credits if content differs.

ARTT618 Drawing (3 Credits)
Independent studies in drawing for advanced special students.
Prerequisite: Permission of ARHU-Art department.
Repeatable to: 12 credits if content differs.

ARTT628 Painting (3 Credits)
Graduate painting for advanced special students.
Prerequisite: Permission of ARHU-Art department.
Repeatable to: 12 credits if content differs.

ARTT638 Sculpture (3 Credits)
Independent studies in sculpture for advanced special students.
Prerequisite: Permission of ARHU-Art department.
Repeatable to: 12 credits if content differs.

ARTT648 Printmaking (3 Credits)
Independent studies in printmaking for advanced special students.
Prerequisite: Permission of ARHU-Art department.
Repeatable to: 12 credits if content differs.

ARTT689 Special Problems in Studio Art (3 Credits)
Restriction: Permission of instructor.
Repeatable to: 6 credits.
Formerly: ARTS689.

ARTT698 Directed Graduate Studies in Studio Art (1-4 Credits)
Independent work. Meetings with faculty and studio time arranged.
Prerequisite: Permission of ARHU-Art department.
Restriction: Must be in Studio Art (Master's) program.
Repeatable to: 12 credits if content differs.
Formerly: ARTS698.

ARTT699 Directed Graduate Studies in Studio Art (1-4 Credits)
Independent graduate studies.
Prerequisite: Permission of ARHU-Art department.
Repeatable to: 12 credits.

ARTT718 Drawing (3 Credits)
Independent studies in drawing for advanced special students.
Prerequisite: Permission of ARHU-Art department.
Repeatable to: 12 credits if content differs.

ARTT728 Painting (3 Credits)
Independent studies in painting for advanced special students.
Prerequisite: Permission of ARHU-Art department.
Repeatable to: 12 credits if content differs.

ARTT738 Sculpture (3 Credits)
Independent studies in sculpture for advanced special students.
Prerequisite: Permission of ARHU-Art department.
Repeatable to: 12 credits if content differs.

ARTT748 Printmaking (3 Credits)
Independent studies in printmaking for advanced special students.
Prerequisite: Permission of ARHU-Art department.
Repeatable to: 12 credits if content differs.

ARTT768 Graduate Colloquium (2 Credits)
Examines various aspects of art, art theory and criticism in a contemporary and multi-cultural context. Relates student work to this context.
Prerequisite: Permission of ARHU-Art department.
Repeatable to: 12 credits if content differs.

ARTT798 Directed Graduate Studies in Studio Art (1-4 Credits)
Independent graduate studies.
Restriction: Must be in Studio Art (Master's) program.
Repeatable to: 12 credits if content differs.
Formerly: ARTS798.

ARTT799 Master's Thesis Research (1-6 Credits)
Formerly: ARTS799.

ASTR - Astronomy

ASTR406 Stellar Structure and Evolution (3 Credits)
Study of stellar internal structure, nuclear reactions, and energy transport. Study of stellar evolution of both low-mass and high-mass stars, including the stellar end states of white dwarfs, neutron stars, and black holes.
Prerequisite: ASTR320; or permission of CMNS-Astronomy department.
Credit Only Granted for: ASTR498N or ASTR406.
Formerly: ASTR498N.

ASTR410 Radio Astronomy (3 Credits)
Introduction to current observational techniques in radio astronomy. The radio sky, radiophysics, coordinates and catalogs, antenna theory, Fourier transforms, interferometry and arrays, aperture synthesis, and radio detectors.
Prerequisite: ASTR232 and PHYS273.

ASTR415 Computational Astrophysics (3 Credits)
Introduction to the most important computational techniques being used in research in astrophysics. Topics include modern high performance computer architectures, scientific visualization and data analysis, and detailed descriptions of numerical algorithms for the solution to a wide range of mathematical systems important in astrophysics.
Prerequisite: ASTR232 and PHYS273.
Jointly offered with: ASTR615.
Credit Only Granted for: ASTR415 or ASTR615.

ASTR421 Galaxies (3 Credits)
Introduction to structure, kinematics, and dynamics of normal and peculiar galaxies. Quantitative descriptions of normal spiral galaxies (like our Milky Way) and elliptical galaxies will be followed by more exotic considerations such as interacting and merging galaxies, and active galactic nuclei.
Prerequisite: ASTR232 and PHYS273.

ASTR422 Cosmology (3 Credits)
Introduction to modern cosmology. Topics include large scale structure of universe, the intergalactic medium, the nature of dark matter cosmological models and galaxy formation.
Prerequisite: Must have completed or be concurrently enrolled in ASTR320; or permission of CMNS-Astronomy department.

ASTR430 The Solar System (3 Credits)
Formation and evolution of the Solar System. Planetary surfaces, interiors, atmospheres, and magnetospheres. Asteroids, comets, planetary satellites, and ring systems. Emphasis on using basic physics to understand observed properties of the Solar System. Intended for students majoring in the physical sciences.
Prerequisite: ASTR232; and PHYS273.

ASTR435 Astrophysics of Exoplanets (3 Credits)
Introduction to exoplanets. Topics include historical development, advantages, and limitations of detection methods, the statistics of exoplanet characteristics, the bulk properties of known expolanets, and remote sensing for characterization of exoplanets.
Prerequisite: ASTR232; and PHYS273.

ASTR450 Orbital Dynamics (3 Credits)
Vectorial mechanics, motion in a central force field, gravitational and non-gravitational forces, the two-body and three-body problems, orbital elements and orbital perturbation theory, resonances in the solar system, chaos. Intended for students majoring in any of the physical sciences.
Prerequisite: Must have completed or be concurrently enrolled in ASTR320; or permission of CMNS-Astronomy department.

ASTR480 High Energy Astrophysics (3 Credits)
The structure, formation, and astrophysics of compact objects, such as white dwarfs, neutron stars, and black holes, are examined. Phenomena such as supernovae and high-energy particles are also covered.
Prerequisite: Must have completed or be concurrently enrolled in ASTR320; or permission of CMNS-Astronomy department.

ASTR498 Special Problems in Astronomy (1-6 Credits)
Research or special study. Credit according to work done.
Restriction: Must be in one of the following programs (Physics; Astronomy) ; and permission of CMNS-Astronomy department.

ASTR601 Radiative Processes (3 Credits)
Emission, absorption, and scattering of radiation by matter, with astrophysical applications. Thermodynamics and statistical mechanics: LTE, Boltzmann, and Saha equations; radiative transfer; atomic and molecular radiation; plasma radiation and transfer: bremsstrahlung, synchrotron emission, Compton scattering.
Restriction: Permission of CMNS-Astronomy department.

ASTR606 Stellar Structure and Evolution (3 Credits)
Models of stellar atmospheres, methods of determinins properties of stars, physical principles governing stellar interior processes, observational data for determining stellar evolution, nuclear processes, stellar modeling.
Restriction: Permission of CMNS-Astronomy department.

ASTR610 Astronomical Instrumentation and Techniques (3 Credits)
Review of Maxwell's equations; designs of telescopes, spectrographs, modern detectors; basic concepts for radio detectors and telescopes; interferometry and data processing.
Restriction: Permission of CMNS-Astronomy department.

ASTR615 Computational Astrophysics (3 Credits)
Introduction to computational techniques used in astrophysical research. Topics include modern high performance computer architectures, scientific visualization and data analysis, and detailed descriptions of numerical algorithms for the solution to a wide range of mathematical systems important in astrophysics.
Restriction: Permission of CMNS-Astronomy department.
Credit Only Granted for: ASTR415 or ASTR615.

ASTR620 Galaxies (3 Credits)
Galaxy classifications; Milky way: basic data, distribution of stars, gas, dust and relativistic particles, large-scale structure and rotation; Spiral galaxies: stellar dynamics and stability, density waves, star bursts, galactic center; Elliptical galaxies: stellar dynamics, cannabalism; galaxy formation.
Restriction: Permission of CMNS-Astronomy department.

ASTR622 Cosmology (3 Credits)
Introduction to modern cosmology. Topics include the large scale structure of the universe, cosmological models, the Big Bang, the cosmic microwave background, the nature of dark matter, and galaxy formation.
Restriction: Permission of CMNS-Astronomy department.

ASTR630 Planetary Science (3 Credits)
The science of our planetary system with an emphasis on the aspects of it, that help us understand the origin of the system and thus the relevance to other planetary systems. Topics will include planetary atmospheres, surfaces, and interiors and the small bodies of the solar system (asteroids, comets, Kuiper-belt objects). We will consider the dynamics of these bodies and the physics and chemistry of these bodies.
Restriction: Permission of CMNS-Astronomy department.

ASTR635 Exoplanetary Astrophysics (3 Credits)
Introduces students to the current state of the exoplanetary field, at a graduate level. Topics covered will include exoplanet detection, exoplanet demographics, planet formation and evolution, planetary atmospheres and interiors, and habitability.
Restriction: Permission of CMNS-Astronomy department.
Credit Only Granted for: ASTR635 or ASTR688E.
Formerly: ASTR688E.

ASTR670 Interstellar Medium and Gas Dynamics (3 Credits)
Content of phases of the interstellar medium: physical processes in the ISM: ionization equilibrium, heating and cooling, interstellar dust; gas dynamics: fluid motions, instabilities, shock waves; magnetohydrodynamics.
Restriction: Permission of CMNS-Astronomy department.

ASTR680 High Energy Astrophysics (3 Credits)
The structure, formation, and astrophysics of compact objects, such as white dwarfs, neutron stars, and black holes, are examined.
Restriction: Permission of CMNS-Astronomy department.
Formerly: ASTR688M.

ASTR688 Special Topics in Modern Astronomy (1-3 Credits)
Special topics such as extragalactic radio sources, plasma astrophysics, the H.R. diagram, chemistry of the interstellar medium, radiophysics of the sun.
Restriction: Permission of instructor.

ASTR690 Reasearch Project I (3 Credits)

ASTR695 Introduction to Research (1 Credit)
Provides an introduction to research programs in the Department of Astronomy and a forum to explore possible research projects. Aimed at incoming graduate students.

ASTR699 Special Problems in Advanced Astronomy (1-6 Credits)

ASTR788 Selected Topics in Modern Astronomy (1-3 Credits)

ASTR799 Master's Thesis Research (1-6 Credits)

ASTR898 Pre-Candidacy Research (1-8 Credits)

ASTR899 Doctoral Dissertation Research (1-8 Credits)

BCHM - Biochemistry

BCHM461 Biochemistry I (3 Credits)
First semester of a comprehensive introduction to modern biochemistry. Structure, chemical properties, and function of proteins and enzymes, carbohydrates, lipids, and nucleic acids. Basic enzyme kinetics and catalytic mechanisms.
Prerequisite: Minimum grade of C- in CHEM271 and CHEM272; or minimum grade of C- in CHEM276 and CHEM277; and minimum grade of C- in (CHEM241 and CHEM242) or CHEM247.
Credit Only Granted for: BCHM461 or BCHM463.

BCHM462 Biochemistry II (3 Credits)
A continuation of BCHM 461. Metabolic pathways and metabolic regulation, energy transduction in biological systems, enzyme catalytic mechanisms.
Prerequisite: Minimum grade of C- in BCHM461.
Credit Only Granted for: BCHM462 or BCHM463.

BCHM463 Biochemistry of Physiology (3 Credits)
A one-semester introduction to general biochemistry. A study of protein structure, enzyme catalysis, metabolism, and metabolic regulation with respect to their relationship to physiology.
Prerequisite: Minimum grade of C- in CHEM271 and CHEM272; or minimum grade of C- in CHEM276 and CHEM277; and minimum grade of C- in (CHEM241 and CHEM242) or CHEM247.
Credit Only Granted for: BCHM461, BCHM462 or BCHM463.

BCHM464 Biochemistry Laboratory (3 Credits)
Biochemical and genetic methods for studying protein function. Site-directed mutagenesis and molecular cloning, protein purification, enzyme activity assays, computer modeling of protein structure.
Prerequisite: BCHM461 or BCHM463; and a grade of C- or better in the prerequisite is required for all College of Computer, Mathematical, and Natural Sciences majors and recommended for all students.
Corequisite: BCHM465.
Restriction: BCHM, CHEM, and Nutritional Sciences majors have first priority, followed by other life science majors.

BCHM465 Biochemistry III (3 Credits)
CORE Capstone (CS) Course. An advanced course in biochemistry. Biochemical approach to cellular information processing. DNA and RNA structure. DNA replication, transcription, and repair. Translation of mRNA to make proteins.
Prerequisite: BCHM461 or BCHM463; and a grade of C- or better in the prerequisite is required for College of Computer, Mathematical, and Natural Sciences majors and recommended for all students.
Recommended: BCHM462.

BCHM477 Biomolecular Measurement and Data Analysis (3 Credits)
Covers a range of classic and modern biochemical assays and techniques as well as introducing data science approaches to "omics" data. Upon successful completion of this course, students should have the necessary preparation and experience to collaborate productively with research scientists in industrial, clinical or academic contexts.
Prerequisite: CHEM271 or CHEM276; and (CHEM277 or CHEM272).
Restriction: Must be in the Chemistry or Biochemistry major.

BCHM485 Physical Biochemistry (3 Credits)
Physical Chemistry with applications to biological systems. Principal topics: quantum chemistry, spectroscopy, structural methods for biological macromolecules, statistical thermodynamics, transport processes in liquid phase, chemical and biochemical kinetics, modeling and simulation, polymer dynamics.
Prerequisite: Minimum grade of C- in CHEM481.
Restriction: Must be in Biochemistry program; or permission of instructor.
Credit Only Granted for: CHEM482 or BCHM485.

BCHM661 Nucleic Acids I (2 Credits)
Topics covered: Chemistry and structure of DNA and RNA, from nucleotides to chromatin, chromosomes, and genomes, and some methods for studying, synthesizing, sequencing and manipulating nucleic acids. Rudimentary genomics and bioinformatics. DNA Biology: selected aspects of the biochemistry and regulation of DNA replication, repair, and recombination, and how these processes interact with each other.
Prerequisite: BSCI410 and BCHM465.

BCHM662 Nucleic Acids II (2 Credits)
Topics covered: Interactions between nucleic acids and ligands such as cations, drugs, and especially proteins. Sources of binding affinity and specificity. Selection-amplification methods. Description of several classes of protein-nucleic acids complexes. DNA/RNA catalysis, the origin of life, mobile genetic elements.
Prerequisite: BCHM661.

BCHM668 Special Problems in Biochemistry (2-4 Credits)
Prerequisite: BCHM464; or students who have taken courses with comparable content may contact the department.

BCHM669 Special Topics in Biochemistry (1-3 Credits)
Prerequisite: BCHM462; or students who have taken courses with comparable content may contact the department.

BCHM671 Protein Chemistry and Enzymic Catalysis (3 Credits)
Principles of protein structure, folding, and function, experimental characterization of structure, active sites, enzyme mechanisms and kinetics.
Prerequisite: BCHM461; or students who have taken courses with comparable content may contact the department.

BCHM675 Biophysical Chemistry (3 Credits)
Conformation, shape, structure, conformational changes, dynamics and interactions of biological macromolecules and complexes or arrays of macromolecules. Physical techniques for studying properties of biological macromolecules.
Prerequisite: CHEM481 and BCHM461; or students who have taken courses with comparable content may contact the department.

BCHM676 Biological Mass Spectrometry (3 Credits)
Fundamentals of modern mass spectrometry and use with biochemical techniques to provide unique analyses of drug metabolites, lipids, carbohydrates, nucleotides and proteins. The interface with bioinformatics will be examined, which provides the foundation of proteomics.
Prerequisite: BCHM461 or BCHM463.
Formerly: BCHM669B.

BCHM677 Computational Tools in Biochemistry (1 Credit)
A practical, hands-on introduction to the application of computational tools that support biochemistry research. Selected topics may include: efficient use of scientific literature databases and the preparation of professional bibliographies; proteomics and mass spectrometry; bioinformatics and genomics programs an database resources; molecular structure visualization and modeling; quatitative data fitting and error analysis; and laboratory research ethics.
Prerequisite: BCHM674 or BCHM671; or permission of instructor.
Restriction: Must be in one of the following programs (Biochemistry (Master's); Biochemistry (Doctoral)) ; or permission of instructor.

BCHM698 Literature Seminar in Biochemistry (2 Credits)
Students will prepare and present a departmental seminar based on a topic in the current biochemical research literature.
Repeatable to: 2 credits if content differs.

BCHM699 Special Problems in Biochemistry (1-6 Credits)
Laboratory experience in a research environment.
Restriction: Must be a first-year student in the Biochemistry Ph.D. program; or must be a student in the Biochemistry non-thesis M.S. option.
Repeatable to: 10 credits.

BCHM799 Master's Thesis Research (1-6 Credits)

BCHM889 Seminar (1-3 Credits)

BCHM898 Pre-Candidacy Research (1-8 Credits)

BCHM899 Doctoral Dissertation Research (1-8 Credits)

BEES - Behavior, Ecology, Evolution and Systematics

BEES608 Seminar in Behavior, Ecology, Evolution and Systematics (1-4 Credits)
One seminar per week for each subject selected: Behavior; Ecology; Evolution; Systematics; Behavior, Ecology, Evoultion and Systematics.
Repeatable to: 15 credits if content differs.

BEES609 Special Topics in Behavior, Ecology, Evolution and Systematics (1-6 Credits)
Lectures, experimental courses and other special instructions in topics appropriate for Behavior, Ecology, Evolution and Systematics (BEES) students.
Repeatable to: 12 credits if content differs.

BEES708 Advanced Topics in Behavior, Ecology, Evolution, and Systematics (1-4 Credits)
Lectures, experimental courses, and other special instruction in various behavioral, ecology, evolution and systematics subjects.
Repeatable to: 12 credits if content differs.

BEES799 Master's Thesis Research (1-6 Credits)

BEES898 Pre-Candidacy Research (1-8 Credits)

BEES899 Doctoral Dissertation Research (1-8 Credits)

BERC - Center for Study of Business, Ethics, Regulation, Crime

BIOE - Bioengineering

BIOE404 Biomechanics (3 Credits)
Quantitative analysis of human movement using engineering mechanics and computational methods. Topics include kinematics, dynamics, inverse dynamics, joint biomechanics, anthropometry, and motion/force measurement, with hands-on labs and project-based learning focused on biomechanical modeling and analysis.
Prerequisite: Minimum grade of C- in ENES102, (MATH243 or MATH246), BIOE120, and BIOE241.
Restriction: Permission of ENGR-Fischell Department of Bioengineering and must be in Engineering: Bioengineering program.

BIOE411 Tissue Engineering (3 Credits)
A review of the fundamental principles involved in the design of engineered tissues and organs. Both biological and engineering fundamentals will be considered.
Prerequisite: Minimum grade of C- in BIOE120 and BSCI330; and must have earned a minimum of 60 credits.
Restriction: Permission of ENGR-Fischell Department of Bioengineering and must be in Engineering: Bioengineering program.

BIOE413 Stem Cell Engineering (3 Credits)
Provides an introduction to the role of stem cells in tissue growth and development, the engineering of stem cells and their environments for regenerative medicine applications, and disease modeling. Topics covered will include basic stem cell biology and mechanobiology; experimental methods for growing, differentiating, studying, and characterizing stem cells; stem cell integration into engineered microenvironments (e.g., tissue scaffolds and biomaterials, organ-on-chip devices, 3D-printed biomaterials); stem cell engineering in clinical applications and disease models; and ethical, commercialization, and regulatory issues in the field of stem cell engineering.
Prerequisite: Must have completed with a minimum grade of C- or be concurrently enrolled in BIOE340; and must have earned a minimum of 60 credits.
Jointly offered with: BIOE613.
Restriction: Permission of ENGR-Fischell Department of Bioengineering and must be in Engineering: Bioengineering program.
Credit Only Granted for: BIOE413 or BIOE613.

BIOE414 Macroscale Biomechanics (3 Credits)
An overview of current problems in movement biomechanics. After taking this course, students will be able to 1) Describe the engineering tools needed to study human movement 2) Recognize a variety of clinical research and practice, and 3) Use the framework provided by the course to pursue their own self-teaching and research on these topics. Topics covered include muscle mechanics, joint mechanics, EMG and EEG signal applications, ultrasonography and elastography, anthropometry, human movement 3-D kinematics, inverse dynamics, forward dynamics, work, power and energy. Biomechanics tools will be used to investigate clinical problems. Students will also do research projects on related topics.
Prerequisite: Minimum grade of C- in BIOE120, BIOE241, ENES102, and (MATH243 or MATH246).
Jointly offered with: BIOE614.
Restriction: Permission of ENGR-Fischell Department of Bioengineering department.
Credit Only Granted for: BIOE414 or BIOE614.

BIOE415 Engineering Design for Global Health (3 Credits)
Many medical technologies are not available in low and middle-income countries due to the cost, infrastructure, and medical expertise required to implement and sustain them. There is tremendous potential to increase access to health care through developing more affordable biomedical technologies, but effective design requires deep understanding of the problem. The goal of this course is to introduce the human-centered design framework and how it can be applied to design new biomedical technologies to solve challenges in global health.
Prerequisite: Minimum grade of C- in BIOE120; and must have earned a minimum of 60 credits.
Jointly offered with: BIOE615.
Restriction: Permission of ENGR-Fischell Department of Bioengineering and must be in Engineering: Bioengineering program.
Credit Only Granted for: BIOE415, BIOE615, BIOE489Y, or BIOE689I.
Formerly: BIOE489Y.

BIOE416 Cardiovascular Engineering (3 Credits)
An overview of engineering applications in the cardiovascular system. Covers cardiovascular anatomy, physiology and pathophysiology in the context of cell and tissue mechanics, fluid mechanics, thermodynamics, biotransport, neurovascular coupling, and imaging. Includes design of cardiovascular devices, sensors, biomaterials, and tissue engineered constructs.
Prerequisite: Minimum grade of C- in BIOE340.
Jointly offered with: BIOE616.
Restriction: Permission of ENGR-Fischell Department of Bioengineering and must be in Engineering: Bioengineering program.
Credit Only Granted for: BIOE416, BIOE616, BIOE489V, or BIOE689K.
Formerly: BIOE489V.

BIOE420 Bioimaging (3 Credits)
Covers the fundamental principles of major biomedical imaging techniques, including X-ray Imaging, Computer Tomography (CT), Magnetic Resonance Imaging (MRI), Ultrasound Imaging, Nuclear Medicine Imaging (SPECT/PET/CT), Optical Coherent Tomography (OCT), and Optical and Hyperspectral Imaging. The course will explore the underlying concepts of imaging system architectures, image reconstruction algorithms, and software implementation. Additionally, it will discuss the clinical interpretation of biomedical images and newer ways to use images for bio-related applications for diagnosis and analysis.
Prerequisite: Minimum grade of C- in BIOE120, BIOE241, and BIOE246.
Restriction: Permission of ENGR-Fischell Department of Bioengineering and must be in Engineering: Bioengineering program.

BIOE431 Fundamentals of Biosensor Techniques, Instrumentation, and Applications (3 Credits)
A thorough review of fundamental concepts of biosensing systems, principles of common detection methods, and modern applications of biosensors. Primarily literature driven. Students will obtain a detailed understanding of cutting-edge biosensing techniques, the instrumentation used, and the application space. Students also will develop skills in using current literature as a source of knowledge.
Prerequisite: Minimum grade of C- in BIOE120, CHEM135, and BSCI330.
Jointly offered with: BIOE631.
Restriction: Permission of ENGR-Fischell Department of Bioengineering and must be in Engineering: Bioengineering program.
Credit Only Granted for: BIOE431, BIOE631, or BIOE658W.

BIOE433 Optical Microscopy (3 Credits)
Includes a large variety of techniques central in many fields of biological and engineering research as well as clinical medicine. This course will provide a comprehensive overview of the fundamentals of optical microscopy. At a fundamental level, the course will cover the interaction of light with tissue, cells and biomaterials, and the mathematical foundations that describe optical systems.
Prerequisite: Minimum grade of C- in BIOE120 and (MATH243 or MATH246).
Restriction: Permission of ENGR-Fischell Department of Bioengineering and must be in Engineering: Bioengineering program.

BIOE437 Computer-Aided Design in Bioengineering (3 Credits)
Introduction to Computer-Aided Design (CAD). Lecture topics will summarize design methodology, review best-practices in hardware development, and discuss engineering applications. The course will culminate in a student-selected project leveraging CAD.
Prerequisite: Minimum grade of C- in BIOE120 or must be in Engineering: Bioengineering program.
Restriction: Permission of ENGR-Fischell Department of Bioengineering and must be in Engineering: Bioengineering program.
Credit Only Granted for: BIOE437, ENME414, or ENME272.

BIOE442 Python: Introduction to Programming and Data Analysis (3 Credits)
Provides an introduction to structured programming, computational methods, and data analysis techniques with the goal of building a foundation allowing students to confidently address problems in research and industry. Fundamentals of programming, algorithms, and simulation are covered from a general computer science perspective, while the applied data analysis and visualization portion makes use of the Python SciPy stack.
Prerequisite: Minimum grade of C- in BIOE120 and BIOE241.
Restriction: Permission of ENGR-Fischell Department of Bioengineering and must be in Engineering: Bioengineering program.

BIOE447 Clinical Experiences in Bioengineering (3 Credits)
An immersion experience in the clinical settings in which biomedical engineering strategies, technologies, and practices are applied. An emphasis will be placed on both clinical problems and engineering solutions.
Prerequisite: Minimum grade of C- in BIOE120 and must have earned a minimum of 60 credits.
Restriction: Permission of ENGR-Fischell Department of Bioengineering and must be in Engineering: Bioengineering program.

BIOE453 Biomaterials (3 Credits)
Examination of the structure and function of natural biomaterials, and cell-extracellular matrix interactions. Study physical properties of synthetic biomaterials for biomedical applications. Understanding molecular level interactions between biomolecules and biomaterials to design novel biomaterials with desirable characteristics. Application of biomaterials as implants, drug delivery systems, biosensors, engineered materials such as artificial skin and bone growth scaffolds will be covered.
Prerequisite: Minimum grade of C- in BIOE120 and CHEM231; must have earned a minimum of 60 credits.
Restriction: Permission of ENGR-Fischell Department of Bioengineering and must be in Engineering: Bioengineering program.
Credit Only Granted for: BIOE453, CHBE457, or ENMA425.

BIOE457 Biomedical Electronics & Instrumentation (4 Credits)
Students learn fundamental concepts of electronics, assembly of electronic components into functional circuits, and integration of functional electronic devices and circuits into a system. In the lab component, students will learn to assemble and evaluate circuits and systems.
Prerequisite: Minimum grade of C- in BIOE120, BIOE241, BIOE246, PHYS260, and PHYS261.
Restriction: Permission of ENGR-Fischell Department of Bioengineering department and must be in Engineering: Bioengineering program.

BIOE461 Synthetic Biology and Biological Engineering (3 Credits)
Students are introduce to the scientific foundation and concepts of synthetic biology and biological engineering. Current examples that apply synthetic biology to fundamental and practical challenges will be emphasized. The course will also address the societal issues of synthetic biology, and briefly examine interests to regulate research in this area.
Prerequisite: Minimum grade of C- in BIOE120, must have earned a minimum of 60 credits.
Restriction: Permission of ENGR-Fischell Department of Bioengineering and must be in Engineering: Bioengineering program.

BIOE462 Therapeutic Development and Delivery (3 Credits)
The ultimate purpose of the pharmaceutical and biotechnology industries is the development and delivery of therapeutics. This course covers fundamentals of engineering and the pharmaceutical sciences related to therapeutics, including basic pharmaceutics/drug delivery, pharmacokinetics, biomolecular kinetics, and regulatory issues. Specific focus is placed on biotherapeutics, including antibodies and protein engineering,RNA and DNA therapeutics (gene therapy and RNAi), extracellular vesicle biotechnology (exosomes), and cell-based therapies, including stem cells. The use of delivery technologies to enable therapeutics (e.g. nanomedicine) will also be discussed.
Prerequisite: Must have completed with a minimum grade of C- or be concurrently enrolled in BIOE340.
Restriction: Permission of ENGR-Fischell Department of Bioengineering and must be in Engineering: Bioengineering program.

BIOE464 Introduction to Computational Molecular Bioengineering (3 Credits)
Designed to introduce students to the principles, methods, and software used for simulation and modeling of macromolecules of biological interest such as proteins, lipids, and polysaccharides. Along with experiment and theory, computational modeling provides new tools for analysis, explanation and prediction. The course is also useful for students who plan to use experimental techniques as their primary approach, but who will employ computational modeling as a tool to obtain integrative understanding of complex systems. Finally, the course should be valuable as an introductory overview for students planning to conduct their thesis research in computational modeling of biological systems. Class topics: Basic statistical thermodynamics, Force fields, Molecular dynamics/ monte carlo methods, Conformational analysis, Fluctuations & transport properties, Free-energy calculations, Multiscale modeling.
Prerequisite: Minimum grade of C- in BIOE232, BIOE372, and BIOE442; and minimum grade of C- in BIOE371 or BIOE246; or permission of Fischell Department of Bioengineering.
Restriction: Permission of ENGR-Fischell Department of Bioengineering department.

BIOE468 Selected Topics in Bioengineering (3 Credits)
Selected topics in Bioengineering will be covered and taught by a variety of department faculty.
Prerequisite: BIOE120 and BIOE121.
Restriction: Permission of ENGR-Fischell Department of Bioengineering department.
Repeatable to: 9 credits if content differs.

BIOE474 Biopharmaceutical Process Development and Manufacturing (3 Credits)
Covers the fundamental steps involved in process development and manufacturing of biopharmaceuticals. An overview of different classes of biopharmaceuticals as well as manufacturing requirements for clinical development and regulatory approval will be provided. In depth coverage of manufacturing steps including cell culture, purification and formulation as well as drug product manufacturing, analysis and stability will be covered. Scientific literature will be used to highlight current challenges and novel solutions in each step of the manufacturing process. Scale up considerations, GMP requirements and process economics will also be introduced.
Prerequisite: Minimum grade of C- in BIOE120 and must have earned a minimum of 60 credits.
Jointly offered with: BIOE674.
Restriction: Permission of ENGR-Fischell Department of Bioengineering and must be in Engineering: Bioengineering program.
Credit Only Granted for: BIOE474, BIOE674, CHBE474, BIOE489T, or BIOE689E.
Formerly: BIOE489T.

BIOE485 Capstone Design I: Entrepreneurship, Regulatory Issues, and Ethics (3 Credits)
This is the first part of a two-semester senior capstone design course which covers principles involved in engineering design, design approaches, economics of design, ethics in engineering, and patent regulations. It also helps students learn team work and write design project proposals under the mentorship of a faculty advisor.
Prerequisite: 21 credits in BIOE courses; and must have completed or be concurrently enrolled in BIOE457.
Restriction: Permission of ENGR-Fischell Department of Bioengineering department; and senior standing; and must be in Engineering: Bioengineering program.

BIOE486 Capstone Design II (3 Credits)
This is the second part of the senior capstone design course. This part is independent instruction where faculty mentoring each project team works with students to order supplies, fabricate their proposed design under BIOE485, test the design, write the report and present it to their fellow seniors and board of faculty mentors. Students are taught to convert the blue print of a design to actual device and test it.
Prerequisite: Must have completed BIOE485 in the immediately preceding semester.
Restriction: Senior standing; and must be in Engineering: Bioengineering program; and permission of ENGR-Fischell Department of Bioengineering department.
Credit Only Granted for: BIOE486 or ENBE486.
Formerly: ENBE486.

BIOE488 Research Methods in Bioengineering (1-3 Credits)
Exploring a variety of research methods in the field of Bioengineering.
Restriction: Permission of ENGR-Fischell Department of Bioengineering department.
Repeatable to: 9 credits if content differs.

BIOE489 Special Topics in Bioengineering (1-3 Credits)
Exploring a variety of topics with Bioengineering.
Restriction: Permission of ENGR-Fischell Department of Bioengineering department.
Repeatable to: 6 credits.

BIOE601 Biomolecular and Cellular Rate Processes (3 Credits)
Presentation of techniques for characterizing and manipulating non-linear biochemical reaction networks. Advanced topics to include mathematical modeling of the dynamics of biological systems; separation techniques for heat sensitive biologically active materials; and rate processes in cellular and biomolecular systems. Methods are applied to current biotechnological systems, some include: recombinant bacteria; plant insect and mammalian cells; and transformed cell lines.
Restriction: Permission of ENGR-Fischell Department of Bioengineering department.
Credit Only Granted for: BIOE601 or ENCH859B.

BIOE602 Cellular and Tissue Biomechanics (3 Credits)
Introduction to the fundamentals of biomechanics including force analysis, mechanics of deformable bodies, stress and strain, multiaxial deformations, stress analysis, and viscoelasticity. Biomechanics of soft and hard tissues.

BIOE604 Cellular and Physiological Transport Phenomena (3 Credits)
A study of transport processes, including momentum, energy and mass transport, relevant to biosystems at various scales from physiological to cellular systems. Transport leads to sets of partial differential equations and the course revolves around approaches to solving these equations to arrive at fundamental understanding of the physics of transport in biosystems.
Restriction: Permission of ENGR-Fischell Department of Bioengineering department.

BIOE605 BIOE Graduate Studies I (1 Credit)
Introduction to the bioengineering graduate program. Students gain exposure to departmental research through lab rotation and to current research in the field through seminar. Students will also gain preparation and guidance on other first-year academic requirements.
Restriction: Must be in ENGR: PhD Only-Bioengineering (Doctoral) program.

BIOE606 BIOE Graduate Studies II (1 Credit)
Second semester continued acclimation to the bioengineering graduate program. Students gain exposure to departmental research through lab rotation and to current research in the field through seminar.
Restriction: Must be in ENGR: PhD Only-Bioengineering (Doctoral) program.

BIOE608 Bioengineering Seminar Series (1 Credit)
A variety of topics related to Bioengineering will be presented in weekly seminars.
Restriction: Must be in one of the following programs (ENGR: PhD Only-Bioengineering (Master's); ENGR: PhD Only-Bioengineering (Doctoral)).
Repeatable to: 6 credits if content differs.

BIOE610 Mathematical Methods in Bioengineering (3 Credits)
From diffusion problems to light-matter interactions, students will learn basic skills needed to create mathematical models in bioengineering. Students will first be exposed to simplified problems in analytical form, and then more complex problems with the help of computer software programs.
Restriction: Permission of ENGR-Fischell Department of Bioengineering.

BIOE611 Advanced Tissue Engineering (3 Credits)
A review of the fundamental principles involved in the design of engineered tissues and organs. Both biological and engineering fundamentals will be considered.
Prerequisite: Must have completed at least one biology course; and MATH241. Or permission of ENGR-Fischell Department of Bioengineering department.
Recommended: BSCI330 and BIOE340.
Restriction: Permission of ENGR-Fischell Department of Bioengineering department.

BIOE612 Physiological Evaluation of Bioengineering Designs (3 Credits)
Bioengineering designs of biomaterials, biomedical devices, imaging and drug delivery agents, tissue engineering, prosthesis (among others), offer the opportunity to improve health care. This course is aimed at providing knowledge to lead bioengineering designs on the basis of biocompatibility and to provide tools to assess their patho-physiological impact in biological systems.
Restriction: Permission of ENGR-Fischell Department of Bioengineering department.

BIOE613 Stem Cell Engineering (3 Credits)
Provides an introduction to the role of stem cells in tissue growth and development, the engineering of stem cells and their environments for regenerative medicine applications, and disease modeling. Topics covered will include basic stem cell biology and mechanobiology; experimental methods for growing, differentiating, studying, and characterizing stem cells; stem cell integration into engineered microenvironments (e.g., tissue scaffolds and biomaterials, organ-on-chip devices, 3D-printed biomaterials); stem cell engineering in clinical applications and disease models; and ethical, commercialization, and regulatory issues in the field of stem cell engineering.
Jointly offered with: BIOE413.
Restriction: Permission of ENGR-Fischell Department of Bioengineering.
Credit Only Granted for: BIOE489J, BIOE413, BIOE689J or BIOE613.
Formerly: BIOE689J.

BIOE614 Macroscale Biomechanics (3 Credits)
An overview of current problems in movement biomechanics. Topics covered include muscle mechanics, joint mechanics, EMG and EEG signal applications, ultrasonography and elastography, anthropometry, human movement 3-D kinematics, inverse dynamics, forward dynamics, work, power and energy. Biomechanics tools will be used to investigate clinical problems. Students will also do research projects on related topics.
Jointly offered with: BIOE414.
Restriction: Permission of ENGR-Fischell Department of Bioengineering department.
Credit Only Granted for: BIOE689X, BIOE489Z, BIOE414, or BIOE614.
Formerly: BIOE689X.

BIOE615 Engineering Design for Global Health (3 Credits)
Many medical technologies are not available in low and middle-income countries due to the cost, infrastructure, and medical expertise required to implement and sustain them. There is tremendous potential to increase access to health care through developing more affordable biomedical technologies, but effective design requires deep understanding of the problem. The goal of this course is to introduce the human-centered design framework and how it can be applied to design new biomedical technologies to solve challenges in global health.
Jointly offered with: BIOE415.
Restriction: Permission of ENGR-Fischell Department of Bioengineering department.
Credit Only Granted for: BIOE615, BIOE415, BIOE689I, or BIOE489Y.
Formerly: BIOE689I.

BIOE616 Cardiovascular Engineering (3 Credits)
An overview of engineering applications in the cardiovascular system. Covers cardiovascular anatomy, physiology and pathophysiology in the context of cell and tissue mechanics, fluid mechanics, thermodynamics, biotransport, neurovascular coupling, and imaging. Includes design of cardiovascular devices, sensors, biomaterials, and tissue engineered constructs
Jointly offered with: BIOE416.
Restriction: Permission of ENGR-Fischell Department of Bioengineering; Must be in ENGR: Bioengineering (Ph.D.) program or Bioengineering (M.S.) program.
Credit Only Granted for: BIOE416, BIOE616, BIOE489V, or BIOE689K.
Formerly: BIOE689K.

BIOE631 Biosensor Techniques, Instrumentation, and Applications (3 Credits)
A thorough review of fundamental concepts of biosensing systems, principles of common detection methods, and modern applications of biosensors. Primarily literature driven. Students will obtain a detailed understanding of cutting-edge biosensing techniques, the instrumentation used, and the application space. Students also will develop skills in using current literature as a source of knowledge.
Restriction: Permission of ENGR-Fischell Department of Bioengineering; and must be in Bioengineering (Ph.D.) program or Bioengineering (M.S.) program.
Credit Only Granted for: BIOE631, BIOE431, or BIOE658W.
Formerly: BIOE658W.

BIOE632 Biophotonic Imaging and Microscopy (3 Credits)
Principles and instrumentation of various biomedical optical techniques, including fluorescene and Raman spectroscopy, confocal and multi-photon microscopy, optical coherence tomography, and diffuse optical tomography. Biomedical aplications will also be discussed.
Recommended: BIOE420.
Restriction: Permission of ENGR-Fischell Department of Bioengineering department.
Credit Only Granted for: BIOE432, BIOE632, or BIOE689C.

BIOE640 Polymer Physics (3 Credits)
Graduate course covering theoretical aspects of the behavior of polymeric materials. It covers statistical properties and thermodynamics of single chain and multichain systems.
Prerequisite: ENMA471; or permission of instructor.
Credit Only Granted for: ENMA620 or BIOE640.

BIOE650 Quantitative Physiology of the Cell (3 Credits)
Introduction to quantitative aspects of neuronal, skeletal muscle, and cardiac physiological systems, with an emphasis on cellular function and plasticity. Complements BIOE603: Electrophysiology of the Cell.
Recommended: MATH246, MATH141, and MATH241.
Credit Only Granted for: BIOE689Q or BIOE650.
Formerly: BIOE689Q.

BIOE651 Applied Mathematics in Bioengineering (3 Credits)
Students will use and learn mathematical concepts that are directly relevant to their career as a bioengineer. They will apply these concepts to various bioengineering applications while also learning industry-relevant analytical software.
Restriction: Restricted to Master's of Engineering - Bioengineering students; or permission of Fischell Department of Bioengineering.
Credit Only Granted for: BIOE651 or BIOE658M.
Formerly: BIOE658M.

BIOE652 Regulatory Affairs in Medical Product Development (3 Credits)
An introductory course on regulations associated with the development and production of medical devices and pharmaceuticals.
Restriction: Restricted to Master's of Engineering - Bioengineering students; or permission of Fischell Department of Bioengineering.
Credit Only Granted for: BIOE652, ANTH627 or BIOE658R.
Formerly: BIOE658R.

BIOE654 Physiology for Bioengineers (3 Credits)
Bioengineering-based designs of biomaterials, biomedical devices, imaging and drug delivery agents, tissue engineering, and prosthesis (among others), offer the opportunity to improve health care. This course is aimed at providing biological knowledge to lead bioengineering designs on the basis of biocompatibility and to provide tools to assess their patho-physiological impact in biological systems.
Restriction: Restricted to Master's of Engineering - Bioengineering students; or permission of Fischell Department of Bioengineering.
Credit Only Granted for: BIOE654 or BIOE658P.
Formerly: BIOE658P.

BIOE658 Special Topics in Bioengineering (M.Eng.) (1-3 Credits)
Special topics in Bioengineering.
Restriction: Must be in the Master of Engineering program or Post-Baccalaureate Certificate of Engineering program; and permission of ENGR-Fischell Department of Bioengineering department.
Repeatable to: 99 credits if content differs.

BIOE664 Computational Molecular Bioengineering (3 Credits)
Designed to introduce students to the principles, methods, and software used for simulation and modeling of macromolecules of biological interest such as proteins, lipids, and polysaccharides. Along with experiment and theory, computational modeling provides new tools for analysis, explanation and prediction. The course is also useful for students who plan to use experimental techniques as their primary approach, but who will employ computational modeling as a tool to obtain integrative understanding of complex systems. Finally, the course should be valuable as an introductory overview for students planning to conduct their thesis research in computational modeling of biological systems. Class topics: Basic statistical thermodynamics, Force fields, Molecular dynamics/ monte carlo methods, Conformational analysis, Fluctuations & transport properties, Free-energy calculations, Multiscale modeling.
Restriction: Permission of ENGR-Fischell Department of Bioengineering.
Credit Only Granted for: BIOE489N, BIOE464, BIOE689U, or BIOE664.
Formerly: BIOE689U.

BIOE674 Biopharmaceutical Process Development and Manufacturing (3 Credits)
Covers the fundamental steps involved in process development and manufacturing of biopharmaceuticals. An overview of different classes of biopharmaceuticals as well as manufacturing requirements for clinical development and regulatory approval will be provided. In depth coverage of manufacturing steps including cell culture, purification and formulation as well as drug product manufacturing, analysis and stability will be covered. Scientific literature will be used to highlight current challenges and novel solutions in each step of the manufacturing process. Scale up considerations, GMP requirements and process economics will also be introduced.
Jointly offered with: BIOE474.
Restriction: Permission of ENGR-Fischell Department of Bioengineering department.
Credit Only Granted for: BIOE674, BIOE474, CHBE474, BIOE489T, or BIOE689E.
Formerly: BIOE689E.

BIOE689 Special Topics in Bioengineering (1-3 Credits)
Research Oriented Individual Instruction course.
Repeatable to: 6 credits if content differs.

BIOE799 Master's Thesis Research (1-6 Credits)

BIOE898 Pre-Candidacy Research (1-8 Credits)

BIOE899 Doctoral Dissertation Research (1-8 Credits)

BIOL - Biology

BIOL608 Biology Seminar (1-2 Credits)
Repeatable to: 8 credits if content differs.
Formerly: ZOOL608.

BIOL609 Special Problems in Biology (1-6 Credits)
One seminar per week for each subject selected: A-Cell Biology; B-Developmental Biology; C-Estuarine and Marine Biology; D-Genetics; E-Parasitology; F-Physiology; G-Systematics and Evolutionary Biology; I-Behavior; J-General; K-Endocrinology; L-Ecology.
Repeatable to: 6 credits if content differs.
Formerly: ZOOL609.

BIOL613 Recombinant DNA (3 Credits)
An advanced course presenting the tools and procedures of genetic engineering. Theory and practical applications of recombinant DNA techniques to understanding eukaryotic gene structure and expression.
Prerequisite: BSCI330 or BSCI230; and BSCI222. Or permission of instructor required.
Credit Only Granted for: BIOL613 or ZOOL652.
Formerly: ZOOL652.

BIOL615 Developmental Genetics (3 Credits)
Differential gene function and its regulation in developing systems. Genes and the analysis of developmental processes.
Prerequisite: Must have completed courses in molecular genetics and developmental or cell biology; or permission of instructor.
Credit Only Granted for: BIOL615 or ZOOL642.
Formerly: ZOOL642.

BIOL625 Biological Ultrastructure (3 Credits)
The ultrastructure of cells and tissues, with emphasis on interpretation and correlation of ultrastructure and function.
Prerequisite: Must have completed a course in Cell Biology or Histology; or permission of instructor.
Credit Only Granted for: BIOL625 or ZOOL615.
Formerly: ZOOL615.

BIOL641 Comparative Physiology (4 Credits)
Cellular and biochemical processes used by animals to interact with both the external and cellular environment. Water balance, intermediary metabolism, nitrogen metabolism, anaerobic metabolism, thermal regulation, nerve and muscle physiology in cells from a broad variety of animal species are considered.
Prerequisite: One year of biology, one year of organic chemistry, and one semester of physiology.
Credit Only Granted for: BIOL641 or ZOOL621.
Formerly: ZOOL621.

BIOL646 Hearing (3 Credits)
Principles of hearing, covering the auditory periphery, the physiology and anatomy of the central auditory system and psychoacoustics.
Prerequisite: BSCI330 or BSCI230; or permission of instructor.

BIOL660 Theoretical Population and Community Ecology (3 Credits)
Application of simple dynamic systems and optimization models to understand the dynamics of populations and ecological communities; population growth, predator-prey interactions, competition, food webs, foraging theory, and evolution of life histories. Instruction and use of the program Mathematica.
Prerequisite: Must have completed one year of college calculus. And BSCI462; or students who have taken courses with comparable content may contact the department.
Credit Only Granted for: BIOL660 or ZOOL675.
Formerly: ZOOL675.

BIOL667 Mathematical Biology (4 Credits)
Mathematical methods of analyzing deterministic and stochastic biological processes from a variety of areas (including population and evolutionary biology, neurobiology, physiology, and morphogenesis). Qualitative aspects of dynamical systems which are usually given as difference or differential equations. The computer program Mathematica will be used to obtain the numerical solutions of these equations.
Credit Only Granted for: BIOL667 or ZOOL625.
Formerly: ZOOL625.

BIOL671 Molecular Evolution (3 Credits)
Basic foundations through advanced concepts in molecular evolution, including patterns and processes of DNA sequence variation, transposable element dynamics, gene duplication and loss, and genome organization. Relevant concepts from genetics, biochemistry, and phylogenetics also will be covered.
Credit Only Granted for: BIOL671 or ZOOL645.
Formerly: ZOOL645.

BIOL704 Cell Biology from a Biophysical Perspective (3 Credits)
An approach to cell biology by focusing on mechanisms and unifying paradigms. It will not assume a great deal of factual biological knowledge, but will expect a background that prepares students to think quantitatively and mechanistically.
Recommended: BSCI330, PHYS121, and PHYS122.
Cross-listed with: BIPH704.
Jointly offered with: BSCI404.
Credit Only Granted for: BSCI404, BIOL704, BIOL708O, or BIPH704.
Formerly: BIOL708O.

BIOL705 Statistics & Modeling for Biologists (3 Credits)
An overview of essential probability and statistics using R with a focus on biological problems. Topics include: parameter estimation (likelihood, Bayesian), confidence intervals and hypothesis testing, multiple testing, experimental design and power analysis, and resampling-based measures of uncertainty. Practical use of computers will be emphasized.
Restriction: Must be in the Biological Sciences Graduate program; or permission of Biology Department.
Credit Only Granted for: BIOL705 or BIOL709F.
Formerly: BIOL709F.

BIOL708 Advanced Topics in Biology (1-4 Credits)
Lectures, experimental courses and other special instructions in various zoological subjects.
Repeatable to: 8 credits if content differs.
Credit Only Granted for: BIOL708 or ZOOL708.
Formerly: ZOOL708.

BIOL709 Selected Advanced Topics in Biology (1-4 Credits)
Lectures, experimental courses and other special instructions in various biological subjects.
Repeatable to: 16 credits.

BIOL710 Plant Ecological Genetics (3 Credits)
Plant ecological genetics is focused on the processes responsible for evolution in plant populations. Covers the basic principle of population genetics, then quickly shifts towards understanding how allele frequencies can change in an ecological context. Emphasis is placed on the role of drift and selection in evolution, and particular attention is placed on plant mating system evolution.
Prerequisite: BSCI472 and BSCI222; or permission of instructor.
Credit Only Granted for: BIOL710 or PBIO745.
Formerly: PBIO745.

BIOL721 Mathematical Population Biology (3 Credits)
Foundational principles for modeling and analysis of real-life phenomena in population biology. Topics include design and analysis of models for general classes of unstructured (single species discrete-time and continuous-time, interacting populations etc.) and structured (spatially-structured, age- structured, sex-structured) population biology models in ecology and epidemiology, dynamics analysis of population biology models (asymptotic stability and bifurcation theory), numerical discretization of continuous-time models, statistical analysis (parameter estimation, uncertainty quantification).
Prerequisite: Calculus, differential equations, modeling, linear algebra, familiarity with mathematical software and programming languages (e.g., MATLAB, R, Python etc.); or permission of instructor.
Cross-listed with: AMSC721, MATH721.
Credit Only Granted for: AMSC721, BIOL721 or MATH721.
Additional Information: Open to advanced undergraduates by permission of instructor.

BIOL762 Physiological Plant Ecology (2 Credits)
Environmental effects on plant ecophysiology. Microclimatology, leaf energy balance, plant responses to temperature and radiation, physiological adaptations, water relations and plant gas exchange.
Prerequisite: BSCI460; or students who have taken courses with comparable content may contact the department.
Credit Only Granted for: BIOL762 or PBIO755.
Formerly: PBIO755.

BIOL765 Sociobiology (4 Credits)
Deals with the description and analysis of animal social organizations the adaptive nature of animal societies, the effects of early experience, and the role of communication in the integration of animal groups.
Prerequisite: Must have completed a course in behavior.
Restriction: Permission of instructor.
Credit Only Granted for: BIOL765 or ZOOL665.
Formerly: ZOOL665.

BIOL767 Behavioral Endocrinology (3 Credits)
The interactive effects of hormones and behavior. Emphasis on the reproductive and stress hormones as they affect the brain and behavior.
Prerequisite: BSCI342 or BSCI447.
Credit Only Granted for: BIOL767 or ZOOL627.
Formerly: ZOOL627.

BIOL799 Master's Thesis Research (1-6 Credits)
Formerly: ZOOL799.

BIOL898 Pre-Candidacy Research (1-8 Credits)

BIOL899 Doctoral Dissertation Research (1-8 Credits)
Formerly: ZOOL899.

BIOM - Biometrics

BIOM405 Computer Applications in Biometrics (1 Credit)
An introduction to computer applications for data analysis. This is equivalent to the computer lab of 601 and is required for students that have taken BIOM301 and BIOM402 and wish to go directly into BIOM602.

BIOM601 Biostatistics I (4 Credits)
Estimation and hypothesis testing, t tests, one and two way analysis of variance, regression, analysis of frequency data. Lecture will emphasize uses and limitations of these methods in biology, while the laboratory will emphasize the use of statistical analysis software for the analysis of biological data.
Prerequisite: BIOM301 or STAT464; or students who have taken courses with comparable content may contact the department.
Credit Only Granted for: BIOM401 or BIOM601.

BIOM602 Biostatistics II (4 Credits)
The principles of experimental design and analysis of variance and covariance.
Prerequisite: BIOM601 or BIOM405.

BIOM603 Biostatistics III (4 Credits)
Applications and implementation of linear model analysis to biological data, including multivariate regression model, mixed model, generalized linear mixed model, nonlinear logistic and Poisson regression models, power calculation and survival analysis.
Prerequisite: Must have completed a graduate-level statistical class; or students who have taken courses with comparable content may contact the department.

BIOM688 Topics in Biometrics (1-3 Credits)
Advanced topics of current interest in various areas of biometrics. Credit assigned will depend on lecture and/or laboratory time scheduled and organization of the course.
Restriction: Permission of AGNR-Animal & Avian Sciences department.
Repeatable to: 6 credits if content differs.

BIOM698 Special Problems in Biometrics (1-3 Credits)
Individual study of a particular topic in biostatistics or biomathematics.
Restriction: Permission of AGNR-Animal & Avian Sciences department; and permission of instructor.
Repeatable to: 6 credits if content differs.

BIOM699 Seminar in Biometrics (1 Credit)

BIPH - Biophysics

BIPH697 Protein Engineering (3 Credits)
Covers the fundamentals of protein engineering and its applications in medicine, chemical processes, and energy. Topics will include the structure and function of biological molecules, rational design and directed evolution, construction of protein and peptide libraries, protein screening platforms, methods for characterizing structure and function of biological molecules. Scientific literature will be used to highlight key discoveries and current work in protein engineering.
Cross-listed with: CHBE697.
Jointly offered with: CHBE497.
Restriction: Permission of ENGR-Chemical & Biomolecular Engineering department.
Credit Only Granted for: CHBE497, BIOE489R, BIPH697, ENCH648P or CHBE697.
Formerly: ENCH648P.

BIPH698 Biophysics Seminar (1 Credit)

BIPH699 Research in Biophysics (2 Credits)
Supervised research in biophysics laboratories. Rotations through several laboratories prior to a choice of laboratory for a research assistantship.
Restriction: Must be in one of the following programs (Biophysics (Master's); Biophysics (Doctoral)).
Repeatable to: 8 credits if content differs.

BIPH703 Introduction to Nonequilibrium Statistical Physics (3 Credits)
Analysis and microscopic modeling of systems away from thermal equilibrium. Linear response theory, ergodicity, Brownian motion, Monte Carlo modeling, thermal ratchets, far-from-equilibrium fluctuation relations. Introduction to the theoretical tools of nonequilibrium phenomena and their application to problems in physics, chemistry and biology.
Prerequisite: PHYS603 or CHEM687; or permission of instructor.
Cross-listed with: CHEM703, CHPH703, PHYS703.
Credit Only Granted for: BIPH703, CHEM703, CHPH703, or PHYS703.

BIPH704 Cell Biology from a Biophysical Perspective (3 Credits)
An approach to cell biology by focusing on mechanisms and unifying paradigms. It will not assume a great deal of factual biological knowledge, but will expect a background that prepares students to think quantitatively and mechanistically.
Recommended: BSCI330, PHYS121, and PHYS122.
Cross-listed with: BIOL704.
Jointly offered with: BSCI404.
Credit Only Granted for: BSCI404, BIOL704, BIOL708O, or BIPH704.
Formerly: BIOL708O.

BIPH799 Master's Thesis Research (1-6 Credits)

BIPH898 Pre-Candidacy Research (1-8 Credits)

BIPH899 Doctoral Dissertation Research (1-8 Credits)

BISI - Biological Sciences

BISI610 Introduction to Behavior, Evolution, Ecology, & Systematics (2 Credits)
This literature-based course serves as an intellectual orientation for new (i.e. first- and second-year) doctoral students in the Behavior, Evolution, Ecology, and Systematics (BEES) concentration area of the Biological Sciences (BISI) Graduate Program.
Restriction: Must be in the Behavior, Evolution, Ecology, and Systematics (BEES) concentration area of the Biological Sciences program; or permission of the instructor.
Credit Only Granted for: BEES608A, BIOL608D or BISI610.
Formerly: BEES608A.

BISI620 Bioinformatics and Genomics (2 Credits)
Provides an overview of some major topics and research areas bioinformatics and genomics, and includes material from basic foundations through advanced concepts.
Credit Only Granted for: CBMG688Y or BISI620.
Formerly: CBMG688Y.

BISI622 Programming for Biology (2 Credits)
Special Topics in Cell Biology and Molecular Genetics; Programming for Biology
Credit Only Granted for: BISI622 and CBMG688P.
Formerly: CBMG688P.

BISI632 Genetics I: Gene Expression (2 Credits)
Molecular mechanisms of gene expression, with an emphasis on gene regulation in both prokaryotic and eukaryotic systems. Approximately 2/3 of the classes will be comprised of didactic lectures. The remaining portion of the course will consist of student-led experimental design sessions and a student-led proposal review panel.
Restriction: Must be in the Biological Sciences Graduate Program (BISI); or permission of instructor.
Credit Only Granted for: BISI632 or CBMG688F.
Formerly: CBMG688F.

BISI699 Special Problems in Biological Sciences (1-6 Credits)
Independent study with a specific faculty instructor from the Biological Sciences Program (BISI). Often involves original research in a laboratory or computational setting.
Restriction: Must be in one of the concentration areas of the Biological Sciences Graduate Program (BISI).
Repeatable to: 8 credits.

BISI701 Teaching & Professional Development in Biology (1 Credit)
Provides graduate students in the biological sciences with the foundational knowledge to become better teaching assistants and gives them an introduction into the skills and tools that they need to develop as professional scientists and educators.
Cross-listed with: ENTM701.
Credit Only Granted for: ENTM701, BISI688Z, CBMG688Z, or BIOL701.
Formerly: BISI688Z, CBMG688Z, BIOL701.
Additional Information: Priority enrollment will be given to students in the BISI Graduate Program.

BISI708 Advanced Topics in Biological Sciences (1-3 Credits)
Lectures, experimental courses, and other special instructions in various areas of biological sciences.
Repeatable to: 8 credits if content differs.

BISI712 Responsible Conduct of Research for Biologists (1 Credit)
An exploration of the ethical dimensions associated with the responsible conduct of scientific research focusing on providing students with practical insights into the existing norms and expectations of working scientists.
Credit Only Granted for: BISI712, BISI688B, or CBMG688B.
Formerly: BISI688B and CBMG688B.

BISI799 Master's Thesis Research (1-6 Credits)
Repeatable to: 99 credits.

BISI898 Pre-Candidacy Research (1-8 Credits)
Restriction: Must be in Biological Sciences (Doctoral) program.

BISI899 Doctoral Dissertation Research (1-8 Credits)

BMGT - Business and Management

BMGT400 Storytelling with AI and Data Visualization (3 Credits)
This course introduces finding and communicating business stories using artificial intelligence and data visualization techniques. As data-driven decision-making becomes increasingly central to modern organizations, professionals must be able to explore complex datasets and translate findings into clear, powerful visual narratives that support strategic insights. Students will examine principles of effective visual communication and cognitive design, consider misinformation in storytelling, and practice tailoring narratives to diverse audiences. They will gain experience developing interactive dashboards and integrating quantitative and qualitative insights into cohesive narratives, enabling them to translate complex data into insights that drive strategic business decisions in an AI-augmented professional environment.
Prerequisite: BMGT302.
Credit Only Granted for: BMGT400 or BMGT408V.
Formerly: BMGT408V.

BMGT401 Big Data and AI Infrastructure (3 Credits)
Big data offers organizations unprecedented opportunities to uncover insights and create value. Artificial intelligence (AI) now permeates daily life and drives innovation across industries such as finance, transportation, and healthcare. Advances in network infrastructure have made big data and AI tools more accessible and affordable for businesses of all sizes. Many organizations still face significant challenges in launching, managing, and scaling AI initiatives that rely on large, unstructured datasets. This course equips students with a solid foundation in key big data and AI technologies through hands-on, experiential learning. By the end of the course, students will be prepared to contribute to the successful design, implementation, and governance of complex data-driven strategies.
Prerequisite: BMGT302.
Credit Only Granted for: BMGT401 or BMGT408E.
Formerly: BMGT408E.

BMGT402 AI Augmented Database Systems (3 Credits)
Examines the fundamentals of database management systems (DBMS), emphasizing data models, query processing, data warehouses, and their role in developing business information systems. Students will master key concepts and gain hands-on experience using industry-standard platforms. They will leverage artificial intelligence (AI) assistants and apply prompt engineering techniques to enhance productivity. The course also explores the value of information resources and common information management challenges within organizations.
Recommended: BMGT302.
Credit Only Granted for: INST327 or BMGT402.

BMGT403 Systems Analysis and Design (3 Credits)
Techniques and tools applicable to the analysis and design of computer-based information systems. System life cycle, requirements analysis, logical design of databases and performance evaluation. Emphasis on case studies. Project required that involves the design, analysis and implementation of an information system.
Prerequisite: BMGT301; or students who have taken courses with comparable content may contact the department.
Recommended: BMGT302.

BMGT404 Essential Data and AI Skills for Business Analytics (3 Credits)
Building on prior programming knowledge, this course introduces principles of data science and AI for business analytics. Students will learn to collect, organize, analyze, and visualize data to support decision-making in areas such as finance, accounting, marketing, and operations. The course emphasizes practical, hands-on exercises using modern, high-level programming languages and industry-standard software. Students will also explore AI tools for analytics, learning their capabilities, limitations, and how they can augment data-driven insights.
Prerequisite: BMGT302.
Credit Only Granted for: BMGT404 or CMSC320.
Additional Information: CMSC majors will not receive credit for this course towards their upper level concentration in their CMSC major.

BMGT406 AI Augmented App Development (3 Credits)
Explores the design and development of modern web applications, emphasizing the platforms, standards, and technologies that power the web. Students will gain hands-on experience building dynamic, data-driven applications while learning to leverage AI assistants and prompt engineering techniques to improve productivity and enhance application functionality. The course also examines social media, social networking, and crowdsourcing, focusing on their roles and applications within organizations.
Prerequisite: BMGT302.
Credit Only Granted for: INST377 or BMGT406.

BMGT407 Information Systems Projects (3 Credits)
Senior capstone course for the information systems major. Collected knowledge from the IS courses and application to significant problems of size and complexity. State-of-the-art research ideas and current business and industrial practices in information systems.
Prerequisite: BMGT302, BMGT402 and BMGT403.
Restriction: Senior standing.

BMGT408 Emerging Topics in Information Systems (3 Credits)
Selected advanced topics covering emerging developments in the field of decision and information technologies.
Restriction: Permission of BMGT-Robert H. Smith School of Business.
Repeatable to: 9 credits if content differs.

BMGT410 Government Accounting (3 Credits)
An introduction to the theory and practice of accounting and financial reporting as applied in both federal and state/local governments, with a focus on generally accepted accounting principles applicable in each. Topics include analyzing transactions; recognizing transactions in the accounting cycles; and preparing and analyzing financial statements and the overall financial reports at both the federal and state/local government levels.
Prerequisite: BMGT221.

BMGT411 Ethics and Professionalism in Accounting (3 Credits)
Analysis and discussion of issues relating to ethics and professionalism in accounting.
Prerequisite: BMGT311.
Restriction: Must be in Accounting program.

BMGT417 Taxation of Corporations, Partnerships and Estates (3 Credits)
Federal taxation of corporations using the life-cycle approach-formation, operation, assessment, merger, reorganization and liquidation. Overviews of pass-through entities - partnerships and s-corporations -using the life-cycle approach, and the tax consequences of wealth transfers by individuals - gift and estate taxation. Both tax planning and compliance issues are addressed.
Prerequisite: BMGT221.

BMGT422 Auditing Theory and Practice (3 Credits)
A study of the independent accountant's attest function, generally accepted auditing standards, compliance and substantive tests and report forms and opinions.
Prerequisite: BMGT310; and must have completed or be concurrently enrolled in BMGT311.

BMGT423 Fraud Examination (3 Credits)
The focus of this course in fraud accounting is on fraud prevention, detection, and investigation as relevant to accountants and fraud examiners. Most organizations are affected to some degree by the occurrence of fraud, whether or not reported. It is estimated that organizations, WORLDWIDE, lost roughly 5% of their annual revenues to fraud. Despite advances in technology, the problem of fraud continues to escalate; and in particular, cybercrime is growing at an alarming rate. The course will serve as an introduction to all of the topics covered in the Certified Fraud Examiner (CFE) examination. While not purporting to be an exam preparation course, the diligent student could be CFE exam ready soon after taking this course. This course provides an introduction to the profession of fraud examination for accounting majors or for individuals seeking to satisfy the educational requirements for the CPA examination.
Prerequisite: BMGT220 or BMGT210.

BMGT424 Advanced Accounting (3 Credits)
Advanced accounting theory applied to specialized topics and current problems. Emphasis on consolidated statements and partnership accounting.
Prerequisite: BMGT311.

BMGT428 Special Topics in Accounting (3 Credits)
Selected advanced topics in Accounting.
Repeatable to: 9 credits if content differs.

BMGT430 Data Modeling in Business (3 Credits)
Explores the role of statistical models in business analytics to drive managerial decision-making and improve performance through the use of relevant data-motivated examples. Topics include regression models (both simple and multiple regression, as well as logistic regression for binary data), model validation, variable transformation, variable selection, discriminant analysis, and forecasting. These topics are modeled using state-of-the-art data analytics software.
Prerequisite: BMGT231 or BMGT230; or permission of BMGT-Robert H. Smith School of Business.

BMGT431 Data Analytics and AI for Business (3 Credits)
An introduction to the tools and machine learning techniques that are central to the analysis of data in order to discover patterns and relationships that are helpful for better business decisions.
Prerequisite: BMGT430.

BMGT434 Analytics Consulting: Cases and Projects (3 Credits)
This course assumes that students have already been introduced to the concepts and techniques of operations research/business analytics (OR/BA). Published papers, short cases, and projects in OR/BA will be analyzed and discussed in a thoughtful way, taking into account the soft (people-related) issues and the hard (mathematical/optimization) issues.
Prerequisite: BMGT332.

BMGT435 Business Process Simulation (3 Credits)
Covers the methods for computer simulation modeling and analysis of complex systems. Students are assumed to have been introduced to the basic techniques and applications in the field of operations management and business analytics. Course emphasis is on modeling of real-world systems (for example, inventory or queueing systems), implementing simulations in special purpose software, and analyzing simulation results.
Prerequisite: BMGT332.

BMGT438 Special Topics in Operations Management (1-3 Credits)
Selected advanced topics in operations management.
Repeatable to: 6 credits if content differs.

BMGT440 Advanced Financial Management (3 Credits)
Lectures and analysis of problems and cases relating to financial decisions of the firm including capital budgeting, capital structure and cost of capital, valuation (discounted cash flow, comparable multiples, comparable transactions), mergers and acquisitions, options, dividend policy, and initial public offerings.
Prerequisite: BMGT340.

BMGT441 Fixed Income (3 Credits)
The course provides an understanding of fixed income securities and methods used to value, analyze, and hedge their risk by participants in the financial services industry (e.g. commercial and investment banks, insurance companies, pension funds, investment companies, hedge funds). Topics covered include zero coupon bonds, coupon bonds, spot and forward rates, bond price sensitivity to interest rate changes (duration and convexity), interest rate derivatives such as forwards, swaps, futures and options, term structure of interest rates, credit risk, and credit derivatives. A thorough review of basic time value of money, continuous time value of money, and derivative securities formulas will be necessary and included while covering the related fixed income instruments.
Prerequisite: BMGT340.

BMGT442 Advanced Portfolio Management (3 Credits)
An in-depth coverage of statistical methods for choosing stocks is provided. Financial markets data is used in the class. Students are also expected to learn and use an industry-standard programming language during the class to implement the concepts of the class.
Prerequisite: BMGT343 and BMGT347.

BMGT443 Applied Equity Analysis and Portfolio Management (3 Credits)
Study and application of the concepts, methods, models, and empirical findings to the analysis, valuation and selection of securities, especially common stock.
Prerequisite: BMGT343.

BMGT444 Futures and Options Contracts (3 Credits)
The institutional features and economic rationale underlying markets in futures and options. Hedging, speculation, structure of futures prices, interest rate futures, efficiency in futures markets and stock and commodity options.
Prerequisite: BMGT343.
Credit Only Granted for: BMGT444 or MATH424.

BMGT445 Banking and Financial Institutions (3 Credits)
Analysis and discussion of cases and readings in commercial bank management. The loan function is emphasized; also the management of liquidity reserves, investments for income and source of funds. Bank objectives, functions, policies, organization, structure, services and regulation are considered.
Prerequisite: BMGT340.
Recommended: ECON330 or BMGT341.

BMGT446 International Finance (3 Credits)
Financial management from the perspective of the multinational corporation. Topics covered include the organization and functions of foreign exchange and international capital markets, international capital budgeting, financing foreign trade and designing a global financing strategy. Emphasis of the course is on how to manage exchange and political risks while maximizing benefits from global opportunity sets faced by the firm.
Prerequisite: BMGT340.

BMGT448 Special Topics in Finance (1-3 Credits)
Selected advanced topics in finance.
Repeatable to: 9 credits if content differs.

BMGT449 Investment Fund Management: Lemma Senbet Fund (3 Credits)
The Lemma Senbet Fund is a year-long, advanced finance course available to undergraduate finance majors in their senior year. Ten to twelve students will be selected in the spring of their junior year to participate on the fund, two as portfolio managers and eight to ten as equity analysts. The course provides students with the opportunity to apply what they have learned in finance classes to actual investment decisions, through researching real companies and managing a portfolio of real money.
Prerequisite: BMGT343.
Corequisite: BMGT443.
Restriction: Permission of BMGT-Robert H. Smith School of Business.
Repeatable to: 6 credits if content differs.

BMGT450 Integrated Marketing Communications (3 Credits)
In-depth study of coordinated marketing activities including advertising, sales promotion, Internet marketing, direct marketing and personal selling. Emphasizes strategic planning to effectively use these promotional tools to communicate with customers and meet marketing goals. Blends theory and current practice to provide managerial orientation.
Prerequisite: BMGT350.
Restriction: Must be in a major in BMGT-Robert H. Smith School of Business.

BMGT453 Retail Management (3 Credits)
Planning and implementing retail marketing strategy. Application to store and non-store (catalog, internet) retailing. Evaluation of how environmental trends in the consumer market, competition, the economy and technology affect retail strategy in the U.S. and global market.
Prerequisite: BMGT220 and BMGT350.
Credit Only Granted for: BMGT353 or BMGT453.
Formerly: BMGT353.

BMGT454 Global Marketing (3 Credits)
Marketing functions from the global executive's viewpoint, including coverage of global marketing policies relating to product adaptation, data collection and analysis, channels of distribution, pricing, communications and cost analysis. Consideration is given to the cultural, legal, financial and organizational aspects of global marketing.
Prerequisite: BMGT350.

BMGT455 Sales Management (3 Credits)
The roles of the sales executive as a planner, manager of resources and marketing functions and recruiter, trainer, motivator and leader of field sales personnel. Techniques and sequence of problem analysis for selling and sales management decisions and to the practical framework in which these decisions take place. Teaching vehicles feature strong classroom interactions, cases, journal articles, research findings, guest sales managers, debates, and modern company practices.
Prerequisite: BMGT350.

BMGT456 Customer-Centric Innovation (3 Credits)
Addresses the management of new products and services with a focus on the innovation process, specifically the development and launching of new products or services: Opportunity Identification, Concept Generation, Design, Testing and Launch.
Prerequisite: BMGT350.
Credit Only Granted for: BMGT352, BMGT382 or BMGT456.
Formerly: BMGT352.

BMGT457 Marketing Policies and Strategies (3 Credits)
This capstone course ties together various marketing concepts using the fundamentals of strategic market planning as the framework. Application of these principles is accomplished by analyzing and discussing cases and by playing a marketing strategy computer simulation game. Analysis of current business articles to understand the link between theory and real-world problem solving.
Prerequisite: BMGT350.

BMGT458 Special Topics in Marketing (1-3 Credits)
Selected advanced topics in marketing.
Repeatable to: 6 credits if content differs.

BMGT461 Entrepreneurship (3 Credits)
Process of creating new ventures, including evaluating the entrepreneurial team, the opportunity and the financing requirements. Skills, concepts, mental attitudes and knowledge relevant for starting a new business.
Restriction: Must not have completed BMGT361.
Credit Only Granted for: BMGT261, BMGT361, BMGT461, ENES460, SMLP470 or HLMN470.

BMGT463 Cross-cultural Challenges in Business (3 Credits)
Examines in depth the nature of international cultural value-differences and their behavioral-related effects in the workplace. Topics include decision-making and leadership styles and reactions to various work assignments and reward structures.
Restriction: Must be in a major in BMGT-Robert H. Smith School of Business.

BMGT465 Business Plan For The New Venture (3 Credits)
Each student focuses on the production of a business plan that will be accepted for an annual business plan competition. Business plans of sufficient quality may be submitted to attract financing. Topics include a deep review of business construction and its derivative short forms.
Prerequisite: BMGT461 or BMGT361.

BMGT466 Global Business Strategy (3 Credits)
Focuses on the strategic challenges that directly result from and are associated with the globalization of industries and companies. Topics include drivers of industry globalization, difference between global and multi-domestic industry, global expansion strategies, sources of competitive advantage in a global context, and coordination of a company across a global network.
Restriction: Must be in a major in BMGT-Robert H. Smith School of Business.

BMGT467 Strategic Innovation and Entrepreneurship (3 Credits)
Provides an understanding of how innovation affects the competitive dynamics of markets, how firms can strategically manage innovation, and how firms can create and implement strategies to maximize their likelihood of success.
Credit Only Granted for: BMGT467, ENES463 or HLMN472.

BMGT468 Special Topics in Management and Organization (1-3 Credits)
Selected advanced topics in management and organization.
Repeatable to: 6 credits if content differs.

BMGT469 Management and Organization Short-term Study Abroad (3 Credits)
Selected short-term study abroad topics in management and organization.
Repeatable to: 9 credits if content differs.

BMGT472 Purchasing and Inbound Logistics (3 Credits)
Analysis of the resupply activities of logistics management, including purchasing policies, transportation planning, and inventory control. Attention is directed toward total cost minimization and the establishment of a sustainable competitive advantage based on procurement.
Prerequisite: BMGT372.

BMGT475 Supply Chain Strategy and Network Design (3 Credits)
Analysis of the strategic aspects of supply chain management. Emphasis on the creation of end-user value through supply chain cost reductions, service improvements or both. Attention is directed toward the enabling role of technology in support of strategy evaluation and implementation.
Prerequisite: BMGT372.

BMGT476 Technology Applications in Supply Chain Management (3 Credits)
An understanding of the role of technology in managing the supply chain. Provides students with hands-on experience in advanced software systems that build on top of enterprise resource planning systems. Major emphasis is placed on demonstrating that these systems result in supply chain cost reductions and service improvements.
Prerequisite: BMGT372.

BMGT477 International Supply Chain Management (3 Credits)
The study of the importance of the supply chain management within a global context. Topics covered include: the structure, service, pricing and competitive relationships among international carriers and transport intermediaries as well as documentation, location decisions, international sourcing/distribution and management of inventory throughout the international supply chain.

BMGT478 Special Topics in Supply Chain Management (3 Credits)
Selected advanced topics in supply chain management.
Repeatable to: 9 credits if content differs.
Additional Information: Course prerequisites will vary depending on the topic. A maximum of 3 credits of BMGT478 course work can fulfill Supply Chain Management major requirements.

BMGT483 Sports Management Program Capstone (3 Credits)
Through interdisciplinary collaboration, students will work in teams to apply their knowledge and skills in sports management to a real-world case. Student teams will be charged to develop innovative and creative solutions to sports management challenges while considering the ethical implications of their proposals.
Prerequisite: BMGT383.

BMGT484 Digital Marketing (3 Credits)
Examines the process of developing, implementing, and analyzing strategies for successfully marketing a variety of existing and potential products and services through digital means, including the web, social media, and mobile apps. Both the development and analysis of digital media for marketing will be discussed.
Prerequisite: BMGT350.
Restriction: Must be in a major in BMGT-Robert H. Smith School of Business.

BMGT485 Project Management (3 Credits)
Modern project management techniques that are used by modern practicing professionals will be covered. Particular attention is given to the management of technology based systems and projects in a business enterprise. The topics covered include: defining project scope, alignment of projects with enterprise strategy, managing project cost, time and risks using tools such as CPM/PERT, and measuring project performance.
Prerequisite: BMGT231 or BMGT230; or students who have taken courses with comparable content may contact the department.
Restriction: Must be in a major in BMGT-Robert H. Smith School of Business.
Credit Only Granted for: BMGT485, ENCE320, ENCE325, INST408O or INST453.

BMGT487 Six Sigma Innovation (3 Credits)
Enhances the overall understanding of Six Sigma Strategy, Tools and Methods to positively influence the performance of a business process, a product or service. Highlights the application of Define-Measure-Analyze-Improve-Control (DMAIC),Design For Six Sigma (DFSS), and the pursuit of Critical to Quality criteria (CTQ's) in a collaborative perspective, one that recognizes a balance between efficiency, and effectiveness and between statistical analysis and statistical thinking.
Prerequisite: STAT400, BMGT231, BMGT230, or ENME392.

BMGT488 Special Topics in Logistics, Business, and Public Policy (1-3 Credits)
Selected advanced topics in logistics, business and public policy.
Repeatable to: 6 credits if content differs.

BMGT490 QUEST Capstone Professional Practicum (4 Credits)
The capstone course for the QUEST Honors Program provides students with an opportunity to learn in multidisciplinary teams of business, engineering, and science students in a real-world setting. Companies engage teams of QUEST students with real organizational challenges and dedicate resources to help students address these problems. Student teams must enhance their skills in quality management, process improvement, and systems design and will apply these to add value to a client. In the process, students will improve their teamwork skills.
Prerequisite: BMGT390, ENES390 or ENED390.
Cross-listed with: ENED490.
Credit Only Granted for: BMGT490, ENES490 or ENED490.
Formerly: ENES490.

BMGT491 Scoping Projects for Business Impact (3 Credits)
Students cultivate relationships with new and current corporate partners and prepare project scopes for QUEST courses. As part of the scoping process, students learn about techniques for reaching out to clients, assessing current relationships to determine how to approach an organization, pitching project sponsorship, and determining a project scope. The course includes independent work networking with clients and phone call and video discussions with potential clients.
Prerequisite: BMGT190, ENES190, ENED290 or BMGT290.
Cross-listed with: ENED491.
Restriction: Must be in the QUEST Program (TQMP).
Credit Only Granted for: BMGT491, ENES491 or ENED491.
Formerly: ENES491.

BMGT493 Honors Study (3 Credits)
First semester of the senior year. The course is designed for honors students who have elected to conduct intensive study (independent or group). The student will work under the direct guidance of a faculty advisor and the Assistant Dean of Undergraduate Studies. They shall determine that the area of study is of a scope and intensity deserving of a candidate's attention. Formal written and/or oral reports on the study may be required by the faculty advisor.
Restriction: Permission of BMGT-Robert H. Smith School of Business.

BMGT494 Honors Study (3 Credits)
Second semester of the senior year. The student shall continue and complete the research initiated in BMGT 493, additional reports may be required at the discretion of the faculty advisor and Assistant Dean of Undergraduate Studies.
Prerequisite: BMGT493.
Restriction: Permission of BMGT-Robert H. Smith School of Business; and must be in the Smith School Honors Fellows program.

BMGT495 Strategic Management (3 Credits)
A case-based course where students learn to play the role of the "strategic manager" who defines the scope of its business operations and, within the chosen scope, how the firm will compete against rivals. This course focuses on how a firm can both formulate effective business-level and corporate-level strategies to achieve competitive advantage and earn above average profits.

BMGT496 Business Ethics and Society (3 Credits)
A study of the standards of business conduct, morals and values as well as the role of business in society with consideration of the sometimes conflicting interests of and claims on the firm and its objectives. Emphasizes a strategic approach by business to the management of its external environment.
Prerequisite: 1 course in BMGT; or permission of BMGT-Robert H. Smith School of Business.

BMGT498 Special Topics in Business and Management (3 Credits)
Special topics in business and management designed to meet the changing needs and interests of students and faculty.
Repeatable to: 6 credits if content differs.

BMGT499 Advanced Business Topics (1 Credit)
Course will delve deeply into a specific business topic. Based on experience and knowledge from undergraduate core business classes, students will examine a particular subject from various angles.
Repeatable to: 3 credits if content differs.

BMGT600 Leadership and Teamwork (2 Credits)
Course examines concepts of team-building and leadership which are critical to managerial success. Topics include leadership, decision making, communication and conflict, work motivation, building effective teams, and organizational change and culture.
Restriction: Permission of BMGT-Robert H. Smith School of Business; or must be in Business and Management (Master's) program.
Credit Only Granted for: BMGT600, BUSI662 or BUSM600.

BMGT602 Introduction to Financial Accounting (2 Credits)
Overview of financial accounting, periodic financial statements and the financial reporting process. Importance of financial statements as information source for creditors and investors and as a means by which managers can communicate information about their firms.
Restriction: Must be in Business and Management (Master's) program; or permission of BMGT-Robert H. Smith School of Business.
Credit Only Granted for: BUSI610, BUAC602, BUFN602, or BMGT602.

BMGT604 Managerial Economics and Public Policy (2 Credits)
Basic microeconomic principles used by firms, including supply and demand, elasticities, costs, productivity, pricing, market structure and competitive implications of alternative market structures. Market failures and government intervention. Public policy processes affecting business operations.
Restriction: Permission of BMGT-Robert H. Smith School of Business; or must be in Business and Management (Master's) program.
Credit Only Granted for: BUSI681 or BMGT604.

BMGT606 Data Driven Decision Making (2 Credits)
Analytical modeling of business decisions; uncertainty, risk and expected utility; regression modeling to infer relationships among variables.
Restriction: Must be in one of the following programs (Business and Management (Master's); Business and Management (Master's)) ; or permission of BMGT-Robert H. Smith School of Business.
Credit Only Granted for: BUSI630 or BMGT606.

BMGT610 Financial Management (2 Credits)
Focuses on the valuation of the real assets of firms as well as the valuation of stocks and bonds, the primary financial assets in an economy. While details vary, the conceptual foundations of valuation boil down to three themes: time value of money, no-arbitrage, and systematic risk.
Restriction: Permission of BMGT-Robert H. Smith School of Business; or must be in Business and Management (Master's) program.
Credit Only Granted for: BUSI640, BUFN610, or BMGT610.

BMGT612 Marketing Management (2 Credits)
Analysis of marketing problems and evaluation of specific marketing efforts regarding the organization's products and services, pricing activities, channel selection, and promotion strategies in both domestic and international markets.
Restriction: Permission of BMGT-Robert H. Smith School of Business; or must be in Business and Management (Master's) program.
Credit Only Granted for: BUSI650 or BMGT612.

BMGT614 Strategic Management (2 Credits)
Analyze and identify profit opportunities and threats in different industry and competitive environments; Analyze and identify a firm's valuable assets, resources and capabilities and how they might be protected, leveraged, and extended in the market; Learn how to organize your company to be the best prepared to adapt its strategy over time as the market environment changes; and how to use organic growth as well as mergers, acquisitions, joint ventures, alliances, and divestitures to ensure that the firm maintians the proper scale and scope to compete effectively over time.
Restriction: Permission of BMGT-Robert H. Smith School of Business; or must be in Business and Management (Master's) program.
Credit Only Granted for: BUSI690 or BMGT614.

BMGT616 Managerial Accounting (2 Credits)
Use of accounting data in corporate planning and control. Cost-volume-profit analysis, budgeting, pricing decisions and cost data, transfer pricing, activity-based management, performance measures, and standard costing.
Restriction: Must be in Business and Management (Master's) program; or permission of BMGT-Robert H. Smith School of Business.
Credit Only Granted for: BUSI611, BUSI616, or BMGT616.

BMGT620 Business Communication (2 Credits)
Develop the ability to communicate with and about data.
Restriction: Must be in Business and Management (Master's) program; or permission of BMGT-Robert H. Smith School of Business.
Credit Only Granted for: BUSI758A or BMGT620.

BMGT624 Operations Management (2 Credits)
Operations management is concerned with efficient and effective design and operation of business processes for delivering products and/or services. Emphasis is given to process analysis and design, capacity management and bottlenecks, waiting lines and the impact of uncertainty in process performance, quality management, lean, six-sigma, and revenue management.
Restriction: Permission of BMGT-Robert H. Smith School of Business; or must be in Business and Management (Master's) program.
Credit Only Granted for: BUSI634 or BMGT624.

BMGT630 Data Models and Decisions (3 Credits)
To develop probabilistic and statistical concepts, methods and models through examples motivated by real-life data from business and to stress the role that statistics plays in the managerial decision making process.

BMGT640 Financial Management (3 Credits)
Analysis of major corporate financial decisions using a market-oriented framework. Introduction to value techniques, capital budgeting principles and problems, asset valuation, operation and efficiency of financial markets, financing decisions, dividend policy and international finance. Additional topics, such as mergers and acquisitions may be covered.

BMGT700 Competitive and Collaborative Negotiation (2 Credits)
Increase negotiating self-confidence and improve capacity to achieve win-win solutions to organizational problems. Improve effectiveness at finding creative solutions to conflict.
Restriction: Must be in Business and Management (Master's) program; or permission of BMGT-Robert H. Smith School of Business.
Credit Only Granted for: BUMO714 or BMGT700.

BMGT708 Special Topics in Cybersecurity (3 Credits)
Special Topics in Cybersecurity
Repeatable to: 9 credits if content differs.

BMGT710 Global Strategy (2 Credits)
Focuses on the "strategic" and "organizational" questions that a company must address as it globalizes its footprint. Among the questions that will be addressed are: What are the potential benefits, costs, and risks associated with going abroad? What differentiates a "global" from a "multidomestic" industry? What are the sources of competitive advantage in a global context?
Restriction: Must be in Business and Management (Master's) program; or permission of BMGT-Robert H. Smith School of Business.
Credit Only Granted for: BUSI674, BUMO754, or BMGT710.

BMGT720 Innovation & Product Development (2 Credits)
This course focuses on the development of innovations - new products or new services - from the perspective of a marketer. For an innovation to be successful in the market, it has to be customer-centric: hence, in this course, we study how to develop and bring to market elegant and efficient solutions to strong customer needs. This is a fundamental business challenge, faced while working in a startup or in an established company; when developing a new product or a new service; and when serving customers who are individuals or large corporations.
Restriction: Must be in Business and Management (Master's) program; or permission of BMGT-Robert H. Smith School of Business.
Credit Only Granted for: BUMK758P or BMGT720.

BMGT730 Valuation in Corporate Finance (2 Credits)
An advanced topics course in Corporate Finance dealing with valuation. Main topics will be, building pro forma statements, cost of capital, using ratios and comparables to value projects and firms, dicounted cash flow valuations, WACC and APV methods of valuation and Real Option Valuations.
Prerequisite: BMGT600.
Restriction: Must be in Business and Management (Master's) program; or permission of BMGT-Robert H. Smith School of Business.
Credit Only Granted for: BUFN630, BUFN714, BUFN750, BUFN753, or BMGT730.

BMGT740 Global Supply Chain Management (2 Credits)
Offers a practical blueprint for understanding, building, implementing, and sustaining supply chains in today's rapidly changing global supply chain environment. It will provide the student with a survey of the fast-moving Supply Chain Management discipline and practice, including the evolution of supply chain strategies, business models and technologies; current best practices in demand and supply management; and methodologies for conducting supply chain-wide diagnostic assessments and formulating process improvement plans.
Restriction: Must be in Business and Management (Master's) program; or permission of BMGT-Robert H. Smith School of Business.
Credit Only Granted for: BUSI672 or BMGT740.

BMGT758 Special Topics in Business and Management (1-4 Credits)
Selected advanced topics in the various fields of graduate study in business.
Prerequisite: Permission of BMGT-Robert H. Smith School of Business.
Restriction: Must be in Business and Management (Master's) program; or permission of BMGT-Robert H. Smith School of Business.
Repeatable to: 9 credits if content differs.

BMGT788 Mastery Topic for EMBA (2 Credits)
Selected mastery topics which will cover various aspects of executive education.
Restriction: Must be in Executive MBA program.
Repeatable to: 8 credits if content differs.

BMGT789 Action Learning Project (3-4 Credits)
Significant consulting project, team designed by individual EMBA student participants and faculty.
Restriction: Must be in Executive MBA program.
Repeatable to: 10 credits if content differs.

BMGT808 Special Topics in Information Systems (1-9 Credits)
Special topics specific to the Information Systems doctoral field of study.
Prerequisite: Permission of BMGT-Robert H. Smith School of Business.
Repeatable to: 18 credits if content differs.

BMGT811 Seminar in Financial Accounting (3 Credits)
Seminar in selected classic and current theoretical and empirical research in financial accounting.

BMGT818 Special Topics in Accounting and Information Assurance (1-9 Credits)
Special topics specific to the Accounting and Information Assurance doctoral field of study.
Repeatable to: 18 credits if content differs.

BMGT821 Seminar in Management Accounting (3 Credits)
Design and use of accounting information systems for managerial planning and controllership.

BMGT828 Independent Study in Business and Management (1-9 Credits)

BMGT830 Operations Research: Linear Programming (3 Credits)
Concepts and applications of linear programming models, theoretical development of the simplex algorithm, and primal-dual problems and theory.
Prerequisite: MATH240; or students who have taken courses with comparable content may contact the department; or permission of BMGT-Robert H. Smith School of Business.

BMGT831 Operations Research: Extension of Linear Programming and Network Analysis (3 Credits)
Concepts and applications of network and graph theory in linear and combinatorial models with emphasis on computational algorithms.
Prerequisite: BMGT830; or students who have taken courses with comparable content may contact the department; or permission of BMGT-Robert H. Smith School of Business.

BMGT833 Operations Research: Integer Programming (3 Credits)
Theory, applications, and computational methods of integer optimization. Zero-one implicit enumeration, branch and bound methods, and cutting plane methods.
Prerequisite: BMGT830; and (MATH241; or students who have taken courses with comparable content may contact the department). Or permission of BMGT-Robert H. Smith School of Business.

BMGT834 Operations Research: Probabilistic Models (3 Credits)
Theoretical foundations for the construction, optimization, and applications of probabilistic models. Queueing theory, inventory theory, Markov processes, renewal theory, and stochastic linear programming.
Prerequisite: MATH241; and (STAT400; or students who have taken courses with comparable content may contact the department). Or permission of BMGT-Robert H. Smith School of Business.

BMGT835 Simulation of Discrete-Event Systems (3 Credits)
Simulation modeling and analysis of stochastic discrete-event systems such as manufacturing systems, inventory control systems, and computer/ communications networks.
Prerequisite: Knowledge of Fortran, Basic, C, or Pascal.

BMGT836 Applied Regression Models (3 Credits)
An introduction to regression models used in business research. Topics include: simple and multiple regression, diagnostics for checking model adequacy, transformations, polynomial models, indicator variables, multicollinearity, variable selection, times series data, generalized linear models, implementation using statistical software, and application to research questions.
Recommended: It is assumed that the student has taken a first course in statistics and is familiar with the content of such course including interval estimation and hypothesis testing.

BMGT837 Applied Multivariate Analysis (3 Credits)
Multivariate statistical methods and their use in empirical research. Topics include: summarization and visualization of multivariate data, the multivariate normal distribution, tests on mean vectors, multivariate paired comparisons, multivariate analysis of variance, repeated measures designs, test on covariance matrices, discriminant analysis and classification, canonical correlation, principal components, factor analysis and cluster analysis. Maximum likelihood estimation and the likelihood ratio method of test construction.
Recommended: BMGT836 or equivalent course. BMGT837 assumes working knowledge of matrices and elementary linear algebra and a sound understanding of univariate statistics, including random variables, statistical inference, ANOVA, and ordinary least squares regression.

BMGT838 Special Topics in Operations Management/Management Science (1-9 Credits)
Special topics specific to the Operations Management/Management Science doctoral field of study.
Repeatable to: 18 credits if content differs.

BMGT840 Seminar in Financial Theory (3 Credits)
Seminar in selected classic and current theoretical and empirical research in the foundations of finance.
Prerequisite: Permission of BMGT-Robert H. Smith School of Business.

BMGT841 Seminar in Corporate Finance (3 Credits)
Seminar in selected classic and current theoretical and empirical research in corporate finance.
Prerequisite: Permission of BMGT-Robert H. Smith School of Business.

BMGT843 Seminar in Portfolio Theory (3 Credits)
Seminar in selected classic and current theoretical and empirical research in portfolio theory.
Prerequisite: Permission of BMGT-Robert H. Smith School of Business.

BMGT848 Special Topics in Finance (1-9 Credits)
Special topics specific to the Finance doctoral field of study.
Repeatable to: 18 credits if content differs.

BMGT858 Special Topics in Marketing (1-9 Credits)
Special topics specific to the Marketing doctoral field of study.
Repeatable to: 18 credits if content differs.

BMGT868 Special Topics in Organizational Behavior/Human Resource Management (1-9 Credits)
Special topics specific to the Organizational Behavior/Human Resource Management doctoral field of study.
Repeatable to: 18 credits if content differs.

BMGT878 Special Topics in Strategic Management and Entrepreneurship (1-9 Credits)
Special topics specific to the Strategic Management and Entrepreneurship doctoral field of study.
Repeatable to: 18 credits if content differs.

BMGT887 Bayesian Inference and Decision Theory (3 Credits)
Bayesian Methodologies in statistical inference and decision theory. Includes discussion of subjective probability and coherence, elicitation of distributions conjugate distributions, estimation, testing, preposterior analysis and regression analysis. Applications are drawn from the functional business areas.

BMGT888 Special Topics in Supply Chain Management (1-9 Credits)
Special topics specific to the Supply Chain Management doctoral field of study.
Repeatable to: 18 credits if content differs.

BMGT898 Pre-Candidacy Research (1-8 Credits)

BMGT899 Doctoral Dissertation Research (1-8 Credits)

BMSO - Online Business MS Programs

BMSO600 Data, Models and Decisions (3 Credits)
The field of data analytics is a very vibrant and broad field. The amount of data available and computing power have exploded in recent years. There is an increasing demand for business analysts who can select and apply the appropriate methods and interpret the results within the context of the problem. The goal of this course is to learn methods for exploring data and building models with the purpose of supporting data-driven decision making. The content of the course can be grouped as follows: Data Exploration, Probability, Confidence Interval Estimation, Hypothesis Testing and Regression Analysis. The focus will be on exploring realistic business scenarios, analyzing datasets using the appropriate analytical techniques, interpreting the analytic output within the context of the business scenario and translating the statistical results into actionable insights.
Prerequisite: Permission of BMGT-Robert H. Smith School of Business.
Restriction: Must be in an online Business Master of Science program; or permission of BMGT-Robert H. Smith School of Business.

BMSO601 Database Management Systems (3 Credits)
The fundamentals of managing data and information within an organization, including enterprise level platforms and tools for data driven analytics. Includes processes for acquiring and cleaning data, storing data, making it available for analytics, visualizing output, and archiving the data for long term use. Involves computational thinking, covers significant theoretical material on data models and queries, and teaches several different analytics and programming tools.
Prerequisite: Permission of BMGT-Robert H. Smith School of Business.
Restriction: Must be in an online Business Master of Science program; or permission of BMGT-Robert H. Smith School of Business.

BMSO602 Decision Analytics (3 Credits)
Difficult decisions require spending scarce resources. A 'resource' is any asset used to leverage business objectives, such as time and money. Tradeoffs are involved in allocating resources to one objective as opposed to another. This course develops a quantitative framework for studying resource allocation problems that arise in many industries and areas such as transportation, advertising, finance, and healthcare. The focus will be on translating verbal descriptions into quantitative optimization models, whereby standard tools (such as Microsoft Excel) can be applied to obtain solutions. The course also covers the role of uncertainty and risk in the decision-making process by using Monte-Carlo simulation models.
Prerequisite: Permission of BMGT-Robert H. Smith School of Business.
Restriction: Must be in an online Business Master of Science program; or permission of BMGT-Robert H. Smith School of Business.

BMSO603 Data Mining and Predictive Analytics (3 Credits)
In the business press, on TV, and in board rooms, 'machine learning,' 'AI,' 'big data' and 'data analytics' are now hot topics. Vast quantities of data are being generated these days, including new types of data such as web traffic, social network data, and reviews and comments on websites. This data is a valuable resource that, when used correctly, can create a competitive edge for companies. Advances in computing hardware and algorithms have significantly improved the quality of predictions and effectiveness of business applications based on them. Expertise in working with data, and a sound knowledge of data mining/machine learning methods, is a much sought after skill. The course provides an introduction to the key tools and techniques of data mining/machine learning, including classification, prediction, cluster analysis, association rules, and text mining. The methods covered are Linear Regression, Logistic Regression, K-nearest neighbors, Naive Bayes, Classification and Regression Trees, Ensemble methods, Neural Networks, K-Means and Hierarchical Clustering, and Association Rules. The focus throughout will be on business applications. Examples from Marketing, Finance, Healthcare, and Operations will be used to illustrate the breadth of applications.
Prerequisite: Permission of BMGT-Robert H. Smith School of Business.
Restriction: Must be in an online Business Master of Science program; or permission of BMGT-Robert H. Smith School of Business.

BMSO610 Financial Management (2 Credits)
This is an introductory course in corporate financial management. The course outlines the financial concepts and techniques used to evaluate corporate decisions. The topics include the time value of money, valuation of common securities, and discounted cash flow. The objectives are to introduce the language and structure of finance and to develop the ability to analyze financial decisions.
Restriction: Must be in an Online Business and Management (Master's) program; or permission of BMGT-Robert H Smith School of Business.

BMSO612 Marketing Management (2 Credits)
This is a hands-on and application-orientated course. It not only introduces students to a variety of marketing decision models, but also teaches them how to estimate these models using statistical software (SAS and GLIMMIX) and how to apply them for decision recommendations. Students will "get their hands dirty" working on five case projects, each of which requires them to analyze the business problem, select and estimate relevant models, interpret estimation results, and make decision recommendations.
Restriction: Must be in an Online Business and Management (Master's) program; or permission of BMGT-Robert H Smith School of Business.

BMSO614 Strategic Management (2 Credits)
The fundamental question that this course addresses is "why are some firms more successful and more profitable than others?" This is both a static and dynamic question, in that we can ask why a given firm is competitively stronger and more profitable at a moment in time, as well as how a firm can sustain competitive advantage and grow profitably over a period of time. This course aims to give you the tools, frameworks, and ideas necessary to develop business strategies, both in the short and the long run. We focus on how best to analyze the structure and dynamics of the external industry environment; how best to analyze and identify a firm's valuable assets, resources and capabilities and how they might be protected, leveraged, and extended in the market; how to respond to environment changes; and how to design strategies for profitable growth and diversification over time.
Restriction: Must be in an Online Business and Management (Master's) program; or permission of BMGT-Robert H Smith School of Business.

BMSO620 Financial Accounting (2 Credits)
Overview of financial accounting, periodic financial statements and the financial reporting process. Importance of financial statements as information source for creditors and investors and as a means by which managers can communicate information about their firms.
Restriction: Must be in an Online Business and Management (Master's) program; or permission of BMGT-Robert H Smith School of Business.

BMSO622 Leadership and Teamwork (2 Credits)
In this course, we lay the foundation for the core capability of leaders: influence. The ultimate outcome of this course is maximizing your capacity to influence people toward a shared goal. The course is also built around the premise that influence isn't a one-size-fits-all approach. The most effective leaders match their approach to the challenge at hand. In other words, the most effective leaders are adaptive; they diagnose the situation and choose the behavior best suited for it. This course gives you a greater awareness of your readiness to influence others and create a high-impact plan for continuing your development.
Restriction: Must be in an Online Business and Management (Master's) program; or permission of BMGT-Robert H Smith School of Business.

BMSO624 Managerial Economics and Public Policy (2 Credits)
In this short course we will study managerial economics at the firm level through the lens of a global company. We will mix classic theory, drawn from renowned experts and case studies, then also put those theories to the test through a competitive online and interactive simulation set within the pharmacology industry. The course will focus on understanding critical aspects of economics that influence firm decisions and behavior. This includes basic microeconomic principles used by firms, including supply and demand, elasticities, costs, productivity, pricing, market structure and the competitive implications of alternative market structures, market failures, and government intervention. Throughout the course we will also discuss public policy processes affecting business operations.
Restriction: Must be in an Online Business and Management (Master's) program; or permission of BMGT-Robert H Smith School of Business.

BMSO630 Statistical Modeling and Data Analytics (2 Credits)
Data analytics is extensively employed in practical settings to gain comprehensive insights into data, extract actionable information, and facilitate strategic decision-making. This course is designed to introduce essential statistical techniques tailored for data analytics. Topics covered include data summarization and presentation, confidence intervals, hypothesis testing, and regression analysis. Additionally, the course places a strong emphasis on the practical application of these techniques and encourages students to actively engage with data analysis exercises to enhance their managerial decision-making capabilities.
Restriction: Must be in an Online Business and Management (Master's) program; or permission of BMGT-Robert H Smith School of Business.

BMSO710 Financial Accounting (2 Credits)
Overview of financial accounting, periodic financial statements and the financial reporting process. Importance of financial statements as information source for creditors and investors and as a means by which managers can communicate information about their firms.
Restriction: Must be admitted to the appropriate graduate business program; or permission of the Masters Programs Office at the Robert H. Smith School of Business.

BMSO723 Strategy Analytics (2 Credits)
The goal of the course is to provide students with a toolkit for making strategic decisions that improve firm and individual performance. In other words, based on your analysis, you will make predictions about how and when policy decisions will influence performance outcomes. Making predictions effectively requires a) a nuanced understanding of the limits of statistical analysis as applied to causal reasoning, b) awareness of common inferential pitfalls, and c) an ability to communicate reports effectively to co-workers and managers.
Restriction: Must be admitted to the appropriate graduate business program; or permission of the Masters Programs Office at the Robert H. Smith School of Business.

BMSO727 Data Visualization (3 Credits)
"A picture speaks more than a thousand words." Welcome to BMSO712! This course focuses on communicating business insights and information by creating advanced visualizations and interactive dashboards using Tableau and Power BI (Business Intelligence Tool). A 100% practical-oriented course and learning-by-doing approach will help the students to solve problems from business domains like marketing, operations, human resources, finance, and so forth.
Restriction: Must be admitted to the appropriate graduate business program; or permission of the Masters Programs Office at the Robert H. Smith School of Business.

BMSO730 Introduction to Supply Chain Analytics (3 Credits)
The intent of this course is to provide students with an overall understanding of the fundamentals of supply chain analytics. Students will be introduced to analytical models and techniques that underlie modern supply chain planning and control systems. The primary supply chain activities of interest will be inventory and transportation.
Restriction: Must be admitted to the appropriate graduate business program; or permission of the Masters Programs Office at the Robert H. Smith School of Business.

BMSO754 Negotiation and Conflict Management (2 Credits)
The course is designed to complement other skills you have developed in different courses at the Smith School of Business, with the basic premise that negotiation skills are needed to implement any technical or analytical solution to different problems at the workplace.
Restriction: Must be in an Online Business and Management (Master's) program; or permission of BMGT-Robert H Smith School of Business.

BMSO755 Organizational Change (2 Credits)
This course aims to provide useful diagnostic tools, intervention strategies, and change models to understand and manage organizational change and its core processes, as well as critical knowledge and skills to initiate and facilitate an organizational change as effective change agent.
Restriction: Must be in an Online Business and Management (Master's) program; or permission of BMGT-Robert H Smith School of Business.

BMSO758 Special Topics in Business (1-4 Credits)
Selected advanced topics in the various fields of graduate study in business.
Prerequisite: Permission of BMGT-Robert H. Smith School of Business.
Restriction: Must be in an online Business Master of Science program; or permission of BMGT-Robert H. Smith School of Business.
Repeatable to: 9 credits if content differs.

BMSO761 Digital Transformation in Business (2 Credits)
Information technology has enabled the transformation of firms, markets, and industries. Amazon is in the process of transforming the publishing industry and has been highly disruptive for booksellers and increasingly for publishers. The digital camera transformed the process of capturing and sharing images. Kodak invented the digital camera, but how did the managers at Kodak respond to digital photography? What is the smartphone doing to low-end digital camera manufacturers? This course examines how to identify transformational technologies and develop strategies to take advantage of them through a set of videos, readings, individual, and team assignments.
Restriction: Must be in an Online Business and Management (Master's) program; or permission of BMGT-Robert H Smith School of Business.

BMSO778 Special Topics in Business (1-4 Credits)
Selected advanced topics in the various fields of graduate study in business.
Prerequisite: Permission of BMGT-Robert H. Smith School of Business.
Restriction: Must be in an online Business Master of Science program; or permission of BMGT-Robert H. Smith School of Business.
Repeatable to: 9 credits if content differs.

BMSO780 Business Ethics (2 Credits)
This class is designed to help you reflect about your own values, to give you a substantive background about ethical pitfalls, and to specifically highlight the unexpected ways in which the work context that we operate in can affect our decisions and behaviors in ways that sometimes detach us from our own values
Restriction: Must be in an Online Business and Management (Master's) program; or permission of BMGT-Robert H Smith School of Business.

BMSO788 Experiential Learning I (2 Credits)
The first part of the class will consist of meeting industry experts in sports management, arts management, consulting, strategy, and more while engaging in weekly individual reflections. This aspect of the class (which spans over 7 weeks Term B) will culminate into a choice of industry to partner with for a consulting capstone project.
Restriction: Must be in an Online Business and Management (Master's) program; or permission of BMGT-Robert H Smith School of Business.
Repeatable to: 4 credits.

BMSO789 Experiential Learning II (2 Credits)
The second part of the class will be dedicated to a consulting project with a client. In this part of the class, students will examine consulting processes, tools, and theories they have acquired throughout their studies in the Master of Science in Business and Management, and apply them to a client project, culminating in a realistic solution deliverable to the client as well as students' reflections and synthesis of their learning.
Prerequisite: BMSO788.
Restriction: Must be in an Online Business and Management (Master's) program; or permission of BMGT-Robert H Smith School of Business.
Repeatable to: 4 credits.

BSCI - Biological Sciences Program

BSCI400 Animal Diversity and Evolution (3 Credits)
Focuses on deep-level diversity of animals and their evolutionary relationships, unique and repeated transitions in the course of animal evolution, and the evolutionary mechanisms that have shaped and continue to shape animal diversity. The course takes an integrative organismal approach to understanding animal evolution, considering morphology, development, physiology, life history, and ecology. It also explores how patterns of animal diversity have changed through time and the processes affecting animal diversity in our changing world.
Prerequisite: Minimum grade of C- in BSCI160 and BSCI207.

BSCI401 Animal Communication (3 Credits)
Examining the mechanisms by which animal produce and receive signals in each sensory modality; and quantifying the type and amount of information conveyed in signals and how animals attend to such information.
Prerequisite: BSCI160 and BSCI161; or BSCI106. And must have completed one semester of physics; and must have completed one semester of organic chemistry.
Recommended: A course in animal behavior or biopsychology.
Credit Only Granted for: BSCI401, BSCI338W or BIOL708W.
Formerly: BSCI338W.

BSCI403 Biology of Vision (3 Credits)
An upper level undergraduate course on the physical, molecular, and neural basis of vision.
Prerequisite: Minimum grade of C- in BSCI207, NEUR306, or BSCI353.
Recommended: BSCI222.

BSCI404 Cell Biology from a Biophysical Perspective (3 Credits)
An approach to cell biology by focusing on mechanisms and unifying physical paradigms. It will not assume a great deal of factual biological knowledge, but will expect a background that prepares students to think mechanistically and quantitatively.
Prerequisite: BSCI330.
Recommended: PHYS121 and PHYS122; or completion of PHYS131 and PHYS132 recommended. Jointly offered with BIOL704, BIPH704.
Credit Only Granted for: BSCI338O, BSCI404, BIOL704, BIOL708O, or BIPH704.
Formerly: BSCI338O.

BSCI405 Population and Evolutionary Genetics (3 Credits)
Genetic variation within a population provides the basis for future evolution as well as a record of past evolution. The genomics revolution provides data on this variation that, together with mathematical models, allow us to read this record to reconstruct evolutionary trajectories. Examples will focus on hominin and pathogen evolution. In the lab, students will use models to explore how genetic variation (allele frequencies) changes over time and space.
Prerequisite: Minimum grade of C- in BSCI222; and 1 course with a minimum grade of C- from (MATH131, MATH136, MATH141). Jointly offered w ith BIOL709.
Credit Only Granted for: BSCI405, BSCI339J, or BIOL709C.
Formerly: BSCI339J.

BSCI406 Membranes and Biological Interfaces (3 Credits)
An interdisciplinary approach to membrane biology, starting with the physical chemistry of interfaces and model systems and continuing into transport, excitability, and signaling. The course is oriented toward students with broad backgrounds in biology and biophysics. Success in the course will come from a background that prepares students to think mechanistically and quantitatively rather than having substantial factual biological knowledge.
Prerequisite: Minimum grade of C- in BSCI330.
Recommended: PHYS122; or PHYS132; or (PHYS260 and PHYS261).
Credit Only Granted for: BSCI339R, BSCI406, or BIOL709R.
Formerly: BSCI339R.

BSCI407 Behavioral Genetics (3 Credits)
Behavior represents an organism's most dynamic phenotype and allows an animal to respond immediately to both internal and external cues. We will explore the genetic and epigenetic mechanisms that underlie behavioral variation and the associated neurological, hormonal, and developmental pathways. We will examine modern approaches used to study behavioral genetics in model and non-model systems, and in humans. Using case studies, we will explore a range of complex phenotypes including those related to mating, parental care, aggression, circadian rhythm, locomotion, learning, anxiety, and addiction.
Prerequisite: Minimum grade of C- in BSCI222.

BSCI410 Molecular Genetics (3 Credits)
An advanced genetics course emphasizing the molecular basis of gene structure and function in the context of modern approaches to the genetics of humans and model organisms.
Prerequisite: BSCI222. And must have completed CHEM233; or (CHEM231 and CHEM232).

BSCI411 Bioinformatics and Integrated Genomics (4 Credits)
Computational methods for the study of biological data. Pairwise and multiple sequence alignment, genome assembly and annotation, RNAseq analysis, and structural bioinformatics. Introduction to UNIX, Python, and R in the context of biological sequence data. Previous computational experience is not necessary.
Prerequisite: Minimum grade of C- in BSCI222.
Recommended: BSCI410.
Credit Only Granted for: BSCI380 or BSCI411.
Formerly: BSCI380.

BSCI412 Microbial Genetics (4 Credits)
A laboratory/lecture based course that covers the fundamentals of mutation, mobile genetic elements and transmission genetics of microbial organisms using both classical and molecular approaches.
Prerequisite: BSCI222; and (BSCI223 or BSCI283).

BSCI413 Recombinant DNA (3 Credits)
An advanced course presenting the tools and procedures of genetic engineering. Theory and practical applications of recombinant DNA techniques to understanding eukaryotic gene structure and expression.
Prerequisite: BSCI330, BSCI223, or BSCI230; and BSCI222.
Formerly: ZOOL452.

BSCI414 Recombinant DNA Laboratory (3 Credits)
An advanced course offering hands-on experience in performing recombinant DNA experiments. All current molecular biology techniques used for cloning prokaryotic genes, analyzing the gene products, and modifying the genes will be performed. Techniques include isolation of DNA, use of restriction enzymes; cloning procedures, PCR analysis, and Southern hybridizations. Lecture material focuses on interpretation of results generated in the laboratory.
Prerequisite: BSCI222.

BSCI415 Molecular Genetics Laboratory (3 Credits)
Problem solving laboratory organized around extended projects that employ different approaches toward linking gene and function.
Prerequisite: Must have completed or be concurrently enrolled in BSCI410.
Restriction: Junior standing or higher.
Credit Only Granted for: BSCI348G or BSCI415.
Formerly: BSCI348G.

BSCI416 Human Genetics (3 Credits)
Approaches to human genetics and applications to biology and medicine focusing on specific human genetic topics using primary research papers as the main resource.
Prerequisite: Minimum grade of C- in BSCI410.
Recommended: BSCI330.

BSCI417 Microbial Pathogenesis (3 Credits)
Current research in microbial pathogenesis and the molecular and cellular basis of bacterial disease. Comprehensive overview of the molecular basis of pathogenesis with a focus on model microbial systems to illustrate mechanisms of disease pathogenesis. Topics covered: how microorganisms attach to and enter cells; how host cells are damaged by microbial products; how the host responds to invasion; and host-pathogen evolution.
Prerequisite: BSCI222; and (BSCI223 or BSCI283).
Restriction: Junior standing or higher.

BSCI420 Cell Biology Lectures (3 Credits)
Molecular and biochemical bases of cellular organization and function in eukaryotes.
Prerequisite: BSCI330, BSCI222, CHEM231, and CHEM232.
Credit Only Granted for: BSCI420 or BSCI421.

BSCI422 Principles of Immunology (3 Credits)
The immune system in health and disease. Presentation and analysis of the cellular and molecular processes that comprise the immune system.
Prerequisite: BSCI222.
Recommended: BSCI330; and (BSCI223 or BSCI283).
Restriction: Junior standing or higher.

BSCI423 Immunology Laboratory (2 Credits)
Current techniques for assessment of immune status and evaluation of the immune response, including monoclonal antibody production, Western blotting, cytokine assays, ELISA and flow cytometry.
Prerequisite: BSCI222.
Corequisite: BSCI422.
Recommended: BSCI223 or BSCI283.
Restriction: Junior standing or higher.

BSCI424 Pathogenic Microbiology (4 Credits)
The role of bacteria and fungi in the diseases of humans with emphasis upon the differentiation and culture of microorganisms, types of disease, modes of disease transmission, prophylactic, therapeutic, and epidemiological aspects.
Prerequisite: BSCI223 or BSCI283.

BSCI425 Advanced Cell Biology Lab Practices (2 Credits)
Experimental techniques used to study the molecular, structural, and spatial organization of plant and animal cells. Using a combination of in vitro assays aimed at analyzing macromolecular and subcellular components and in vivo analyses designed to reveal the inner architecture of a typical eukaryotic cell, students will have an opportunity to: improve some of the basic technical and conceptual skills they acquired in an introductory cell biology course; develop a more sophisticated understanding of the nature of experimental cell manipulation; and tackle the ongoing challenge of articulating their findings in both written and oral communication.
Prerequisite: Must have completed BSCI330, BSCI222, CHEM231, and CHEM232; and must have completed or be concurrently enrolled in BSCI420.
Credit Only Granted for: BSCI421, BSCI425, or BSCI348C.

BSCI426 Global Change Biology (3 Credits)
Explore the biology of past, present and future global change and its impacts on the diversity of life. Focus on mechanisms of global change; organismal responses to that change, examples of past change, estimates of future change, and approaches to mitigation.
Prerequisite: Minimum grade of C- in BSCI207.
Recommended: BSCI361 and BSCI370.

BSCI430 Developmental Biology (3 Credits)
Structural, functional and regulatory events and mechanisms that operate during development to produce an integrated, multicellular organism composed of a multitude of differentiated cell types.
Prerequisite: BSCI222 and BSCI330.

BSCI431 The Origin and Evolution of Nervous Systems (3 Credits)
Explore how brains change through evolution along the animal tree of life. By comparing the nervous system structure and development across the animal kingdom, this course aims to reveal common designs and mechanisms that generate behavior, and to inform our understanding of how biology builds minds. Topics include the origins of neurons, the universal molecular patterning of brain development across invertebrates and vertebrates, the evolution of neurotransmission, comparative mechanisms of learning and memory, and what in our brain makes us human.
Prerequisite: Minimum grade of C- in NEUR200 or BSCI207.

BSCI432 Systems View of Cell Biology (3 Credits)
An integrated understanding of cell biology based upon reading of literature, discussion of new findings, and quantitative simulations. Exploration of ten topics including Heredity, Curing Diseases, and Synthesizing Life.
Prerequisite: BSCI330.

BSCI433 Biology of Cancer (3 Credits)
Causes and consequences of neoplastic transformations at the biochemical and cellular levels.
Prerequisite: BSCI222 and BSCI330; or permission of CMNS-Biological Sciences UG Program.

BSCI436 RNA Biology and Therapeutics (3 Credits)
The prediction of RNA structure from its sequence, and how the many types of cellular and viral RNAs function in and regulate cellular processes. Use of RNA-based drugs for controlling disease through RNA targeting, editing and vaccines.
Prerequisite: 1 course from (BSCI330, BSCI331, BSCI230); and 1 course from (BSCI222, HLSC322).
Recommended: BSCI410.
Restriction: Must have junior standing or higher.

BSCI437 General Virology (3 Credits)
Discussion of the physical and chemical nature of viruses, virus cultivation and assay methods, virus replication, viral diseases with emphasis on the oncogenic viruses, viral genetics, and characteristics of the major virus groups.
Prerequisite: BSCI222; or permission of CMNS-Biological Sciences UG Program.
Restriction: Junior standing or higher.

BSCI439 Undergraduate Advanced Selected Topics in Biology (1-4 Credits)
Lectures, seminars, mini-courses, and other special instruction in various biological subjects.
Repeatable to: 9 credits if content differs.

BSCI440 Mammalian Physiology (4 Credits)
A study of the cardiovascular, hemopoietic, gastrointestinal, renal and respiratory systems. Chemical and endocrine regulation of physiological functions in mammals. Course does not count as an upper level lab for BIOL majors (see BSCI441).
Prerequisite: BSCI330; and (CHEM231 and CHEM232; or must have completed CHEM233). Or permission of CMNS-Biological Sciences UG Program.
Credit Only Granted for: BIOE340, BSCI440, or BSCI450.

BSCI441 Mammalian Physiology Laboratory (2 Credits)
Laboratory exercises in experimental mammalian physiology.
Prerequisite: Must have completed or be concurrently enrolled in BSCI440.
Credit Only Granted for: BSCI441 or BSCI451.

BSCI442 Plant Physiology (4 Credits)
An in-depth examination of the unique molecular and physiological principles necessary to understand how plants grow and respond to the environment at the cellular and organismal levels. Plants evolved unique metabolism and survival strategies, so students should be prepared to enter a world that may be new to them.
Prerequisite: Minimum grade of C- in BSCI170 and BSCI171; or minimum grade of C- in PLSC201; and minimum grade of C- in CHEM231 and CHEM232; or minimum grade of C- in CHEM237.
Cross-listed with: PLSC400.
Credit Only Granted for: BSCI442 or PLSC400.

BSCI443 Microbial Physiology (3 Credits)
Microbial cellular and population growth. Fermentation metabolism, physiology of anaerobiosis, and energy conservation and transformation in bacterial membranes. Efficiency of energy utilization for growth. Membrane structure and transport. Bacterial motility and chemotaxis. Regulation of bacterial chromosome replication, RNA and protein synthesis. Control of metabolic pathways. Bacterial stress responses. Antimicrobials.
Prerequisite: Minimum grade of C- in BSCI223 or BSCI283; and minimum grade of C- in BCHM461 or BCHM462.

BSCI446 Advanced Systems Neuroscience (3 Credits)
Neural development, neurobiology of sensation and perception, motor and integrative systems organization in the central nervous system. Neural systems dysfunction as related to medical pathologies and discussion of contemporary neuroscience methods used to understand brain function.
Prerequisite: Minimum grade of C- in BSCI353 or NEUR306.

BSCI447 General Endocrinology (3 Credits)
Functions and dysfunctions of the endocrine system with special reference to mammals.
Prerequisite: BSCI330, CHEM241, and CHEM242.

BSCI450 Mammalian Systems Physiology (3 Credits)
A study of the cardiovascular, hemopoietic, gastrointestinal, renal, and respiratory systems. Chemical and endocrine regulation of physiological functions in mammals.
Prerequisite: Minimum grade of C- in BSCI330; and minimum grade of C- in CHEM233 or both CHEM231 and CHEM232.
Credit Only Granted for: BIOE340, BSCI440, or BSCI450.

BSCI451 Mammalian Systems Physiology Laboratory (2 Credits)
Laboratory exercises in experimental mammalian physiology.
Prerequisite: Must have completed with a minimum of C- or be concurrently enrolled in either BSCI440 or BSCI450.
Credit Only Granted for: BSCI441 or BSCI451.
Formerly: BSCI441.

BSCI452 Diseases of the Nervous System (3 Credits)
An advanced course covering the neuroanatomy, function, and organization of the nervous system and its implication for pathology and disease.
Prerequisite: Minimum grade of C- in BSCI330; and must have completed with a minimum of C- or be concurrently enrolled in either BSCI353 or NEUR306.
Credit Only Granted for: BSCI452, BIOL708E, or NACS728N.

BSCI453 Biology of Hearing (3 Credits)
Acoustic and neural basis of hearing. The auditory system will be described with a comparative approach across species.
Prerequisite: Minimum grade of C- in BSCI207 or NEUR200.
Recommended: BSCI353 or NEUR306.

BSCI454 Neurobiology Laboratory (2 Credits)
Basic neuroanatomical techniques, intracellular and extracellular recordings of electrical potentials from nerve and muscle.
Prerequisite: Minimum grade of C- in BSCI330; must have completed or be concurrently enrolled in BSCI353; and must have completed or be concurrently enrolled in PHYS122, PHYS132, or PHYS142.
Credit Only Granted for: BSCI454, BSCI455, NEUR405, or PSYC401.

BSCI455 Neuroscience Laboratory (3 Credits)
Students will utilize neurophysiological techniques to examine fundamental principles of neurons and neural circuits. This course will reinforce content from prerequisite NEUR courses. Students will also strengthen skills in experimental design and scientific writing.
Prerequisite: NEUR306 or BSCI353; and PHYS132.
Recommended: NEUR305.
Cross-listed with: NEUR405.
Credit Only Granted for: PSYC401, NEUR405, BSCI455 or BSCI454.

BSCI456 Advanced Cellular Neuroscience (3 Credits)
Readings and discussion in cellular and molecular mechanisms underlying synaptic structure/function relationships, synaptic potentiation/depression, dendritic integration, homeostatic plasticity, and nervous system development including neurogenesis, axon guidance, synaptogenesis, and activity-dependent development among other topics.
Prerequisite: Minimum grade of C- in BSCI353 or NEUR306.
Recommended: Minimum grade of C- in BSCI440 or another upper-level neuroscience course.
Jointly offered with: NACS644.
Restriction: Permission of CMNS-Biology department.
Credit Only Granted for: BSCI339X, BSCI456, or NACS644.
Formerly: BSCI339X.

BSCI462 Population Ecology (3 Credits)
Theory of population growth and regulation, life tables, and theory of competition and predation, evolution in ecological settings, community structure and dynamics.
Prerequisite: MATH130, MATH136, or MATH140; and BSCI361.

BSCI464 Microbial Ecology (3 Credits)
Interaction of microorganisms with the environment, other microorganisms and with higher organisms. Roles of microorganisms in the biosphere. Microorganisms and current environmental problems.
Prerequisite: BSCI223 or BSCI283; and (CHEM271 or CHEM277); or permission of the instructor.

BSCI467 Freshwater Biology (4 Credits)
Biology and ecology of freshwater invertebrates in lotic and lentic habitats, their adaptation to aquatic life, their function in aquatic ecosystems, and their relationship to environmental deterioration. Laboratory will include field trips, demonstrations, and identifications.
Prerequisite: BSCI160.

BSCI471 Molecular Evolution (3 Credits)
Patterns of DNA sequence variation within and between species, caused by nucleotide changes and the movement of transposable elements. Theories of molecular evolution, such as the neutral theory. Molecular clock hypothesis: its importance as a practical empirical tool in molecular genetics and systematics and its theoretical foundation.
Prerequisite: BSCI222; or permission of CMNS-Biology department.

BSCI473 Marine Ecology (3 Credits)
Courses in evolution and animal behavior are strongly recommended. A detailed analysis of the evolutionary ecology of marine invertebrates; emphasis on testing of theories and on current literature.
Prerequisite: BSCI207.

BSCI475 Sexual Selection in Nature (3 Credits)
Sexual selection drives some of the most spectacular, if not bizarre, traits in nature. We will explore how organisms select and compete for mates and fertilization success, and how this powerful and pervasive evolutionary force shapes sexual traits and regulates species boundaries. We will focus on the key theories in the field and discuss recent and classic research papers. This is a student-directed class: course topics and materials will be selected based on student interests and involvement. On occasion, experts in the field will be invited to class to discuss their research.
Prerequisite: Minimum grade of C- in BSCI207; or permission of instructor.
Recommended: BSCI360 or BSCI370. Jointly offered with BIOL708.
Credit Only Granted for: BSCI338X, BSCI475, or BIOL708X.
Formerly: BSCI338X.

BSCI476 Evolutionary Genomics (3 Credits)
Application of genomics to understanding evolutionary processes, including genome evolution, organismal evolution, genomic diversity across the tree of life, human evolution and disease. Relevant concepts of evolutionary genetics and genome biology will be covered.
Prerequisite: Minimum grade of C- in BSCI222.
Recommended: BSCI370.
Credit Only Granted for: BSCI476 or BIOL708C.

BSCI477 Ecology and Evolution of Infectious Disease (3 Credits)
Parasites are a ubiquitous feature of ecological communities, and can strongly impact population growth, extinction risk, community structure and biodiversity, as well as pose serious risks to human health and food security. This course will cover basic principles of disease ecology, including; the diversity of parasitic organisms and transmission modes, host and pathogen traits for defense and infection, mathematical models of disease spread, the impacts of disease at different ecological scales, and host-parasite co-evolution. In the latter half of the course we will apply these basic concepts to current real-world problems in disease ecology including emerging infectious diseases in humans, wildlife and agriculture. We will use examples from plants, animals and humans to about an equal degree. This course will have a strong quantitative focus, and completion of the math series is recommended.
Prerequisite: C- or better in either BSCI370 or BSCI361 and either MATH136 or MATH140.
Credit Only Granted for: BSCI477 or BIOL708D.

BSCI480 Arthropod Form and Function (4 Credits)
Survey of the morphological, systematic and physiological diversity of the phylum Arthropoda.
Prerequisite: Permission of CMNS-Entomology (AGNR).

BSCI481 Insect Diversity and Classification (4 Credits)
A summary of the morphology, systematics and evolution of insects and techniques for their collection, preservation and identification. Emphasis is placed on the diversity of insects in North America, particularly Maryland and adjacent regions. An insect collection is required.
Prerequisite: BSCI337.

BSCI482 Insect Physiology and Molecular Biology (4 Credits)
Physiological and biochemical functions of insects. Insect endocrinology, neurobiology, sensory physiology, integument and molting, development and metamorphosis, immunity, metabolism and related topics.
Prerequisite: BSCI337.

BSCI483 Insects, Pathogens, and Public Health (3 Credits)
Explores how mosquitoes, ticks, and other blood-feeding arthropods shape human and animal health, from direct injury to the spread of globally important vector-borne diseases.
Prerequisite: BSCI207.

BSCI487 IPM: Science-Based Decision Making for Sustainable Pest Management (4 Credits)
Long-term global food security requires a sustainable increase in agricultural productivity to ensure the availability and accessibility of safe and nutritious food. Agricultural pests reduce global food production and threaten its sustainability. This course explores sustainable pest management in agroecosystems using the integrated pest management (IPM) paradigm. IPM is an ecosystem-based strategy that focuses on long-term prevention of pests or their damage through a combination of techniques such as biological control, habitat manipulation, modification of cultural practices, and use of resistant varieties. Pesticides are used only after monitoring indicates they are needed according to established guidelines, and treatments are made with the goal of removing only the target organism. Pest control materials are selected and applied in a manner that minimizes risks to human health, beneficial and non-target organisms, and the environment.
Prerequisite: BSCI160 and BSCI161.
Restriction: Must have earned a minimum of 90 credits.
Credit Only Granted for: BSCI487 or ENTM609.

BSCI488 Summer Biology Institutes (1-8 Credits)
Prerequisite: Permission of CMNS-Biological Sciences UG Program.
Repeatable to: 12 credits if content differs.

BSCI494 Animal-Plant Interactions (3 Credits)
Theoretical, conceptual and applied aspects of evolutionary and ecological interactions between plants and animals. This course gives an overview of major ideas, historical controversies, and current research on animal-plant relationships. We will explore the mechanisms and evolution of plant defenses and animal counter-adaptations, behavioral ecology and interactions across trophic levels, the role of microbial communities in mediating interactions, and how these interactions color human experience through food and medicine. The course will have a blended lecture/discussion format and will include field walks to collect herbivory data and observe animal-plant interactions.
Prerequisite: BSCI160 and BSCI161; or BSCI106.

BSCI497 Insect Pests of Ornamentals and Turf (4 Credits)
The recognition, biology and management of insects and mites injurious to ornamental shrubs, trees, greenhouse crops, and turf. Emphasis on Integrated Pest Management (IPM).
Prerequisite: BSCI160 or BSCI337; or (PLSC110 and PLSC111) or (PLSC112 and PLSC113).

BSOS - Behavioral and Social Sciences

BSOS438 Special Topics in Study Abroad IV (1-6 Credits)
Special topics course taken as part of an approved study abroad program.
Repeatable to: 15 credits if content differs.

BSOS448 Teaching Assistant Practicum (1-6 Credits)
Supervised practicum for teaching assistants for BSOS/UNIV courses.
Repeatable to: 9 credits.

BSOS678 Special Topics in Justice Leadership (3 Credits)
Crime and Criminal Justice in Vietnam. Issues that will be focused on the present situation of crime in Vietnam; causes and conditions of criminal activities; include crime forecasting and crime prevention in Vietnam. Also, provides comprehensive overview on the Criminal Justice System in Vietnam and relations among authorities.
Repeatable to: 18 credits if content differs.

BSOS685 Big-Data Analysis on the BSOS HPC Cluster (2 Credits)
Social media are a primary source of information on social interaction and personal interests. High-performance computing (HPC) is employed to search for hidden pattern and unknown correlations using advanced machine-learning algorithms available in python and R packages. The main steps of Natural Language Processing and big-data analysis are being worked out, from examining random samples to analyzing large data sets via in-memory Monte-Carlo applications and neural networks.
Prerequisite: Students must have completed a least one college-level statistics course.
Recommended: A working knowledge of python or R is expected.
Restriction: Students must be enrolled in a BSOS graduate program; or permission of instructor.
Credit Only Granted for: BSOS385, BSOS685, or BSOS688B.
Formerly: BSOS688B.

BSST - Terrorism Studies

BSST458 Special Topics in Study Abroad IV (1-6 Credits)
Special topics course taken as part of an approved study abroad program.
Repeatable to: 15 credits if content differs.

BSST630 Motivations and Intents of Terrorists and Terrorist Groups (3 Credits)
Examines motivations for terrorism from an interdisciplinary perspective, with emphasis on political and applied social psychological perspective. Topics may include: defining terrorism; preconditions; recruitment; domestic and international terrorism; and case studies and analysis of terrorist organizations.

BSST631 Societal Impacts of and Responses to Terrorism (3 Credits)
Explores the manners in which a variety of different actors respond to both terrorist incidents and the threat of terrorism. Examines local responses to terrorist incidents; local impacts of terrorism including effects on individual and group attitudes and behaviors; policy decisions made in response to both terrorist attacks and the threat of terrorism; terrorism prevention, deterrence, interdiction, and mitigation efforts; and individual and community recovery from terrorist attacks.
Credit Only Granted for: BSOS631 or BSST631.
Formerly: BSOS631.

BSST633 Research Methods in Terrorism and Counterterrorism (3 Credits)
Provides students with the opportunity to conduct original research, while exposing them to analytical tools relevant to the study of terrorism. Students will work with a range of data sources on domestic and international terrorism, and will be tasked with using data to test hypotheses related to the causes, behaviors, and/ or impacts of terrorism.
Credit Only Granted for: BSOS633 or BSST633.
Formerly: BSOS633.

BSST634 Legal and Criminal Approaches to Counterterrorism (3 Credits)
The United States and many of her allies have challenged long-standing legal boundaries in their effort to combat terrorism. This course examines these responses, including: increased criminalization of terrorism related activities; aggressive criminal prosecutions; detention of suspected terrorists indefinitely in far-off prisons; implementation of enhanced interrogation techniques; launch of drones to kill alleged terrorists, even U.S. citizens; and deployment of a vast system of mass surveillance.

BSST635 Countering Violent Extremism: Policy and Practice (3 Credits)
In recent years, the understanding of how and why individuals engage in violent extremism and terrorism has evolved and become more nuanced, as have the tools to mitigate these threats. A field of policy and practice called Countering Violent Extremism (CVE) has emerged that focuses on countering the pull of terrorist recruitment and influence by building resilience among populations vulnerable to radicalization.

BSST636 Quantitative Research Methods in Terrorism Studies (3 Credits)
Introduction to probability, statistics and data analysis, particularly with respect to how they are used in the study of terrorism. Students will learn fundamental principles of probability and statistical inference, how to summarize data and make statistical inferences, and how to manipulate and analyze data in a statistical software package (Stata) that is widely used in the discipline. The course provides a foundation in quantitative analysis that will enable students to critically evaluate extant quantitative research and manipulate their own data. It will also prepare interested students for more advanced statistics training.

BSST637 Qualitative Research Methods in Terrorism Studies (3 Credits)
Explores research design and qualitative methods using a hands-on approach. The course considers general themes such as the logic of inquiry, the appropriateness of qualitative approaches, as well as more specific topics such as process tracing, archival research, and survey methodology. It also provides students with the opportunity to learn and apply different tools for social science research.

BSST638 Special Topics in Terrorism Studies (3 Credits)
A special topics course for students in the Global Terrorism Minor program. Topics that may be offered are Psychology of Terrorism; Development of Counterterrorism Policies and Programs; Terrorism and Popular Culture; Terrorism and the Media; International Perspective on Terrorism and Counterterrorism (Education Abroad); The Evolution of Hezbollah; Terrorism and Small Wars; Political Islam in the West.
Repeatable to: 9 credits if content differs.

BSST639 Applied Analysis for Security Studies (3 Credits)
Introduces students to novel approaches for applied research in security studies. Topics include simulations, wargaming exercises, red teaming, and horizon scanning. This course assumes no prior experience with these methods. Throughout the course, students will complete interactive strategy-based activities to understand the behavior of violent non-state actors and how to use applied methods to counter militant groups.

BSST640 Theories of Security and Terrorism Studies (3 Credits)
Security and Terrorism Studies is a broad field that includes relevant theoretical voices from across the social sciences, philosophy, and policy. This course will mainly pull from sociological, psychological, and political science (international relations) theory to help students understand the theoretical foundation for the field and for their research. Specific topics may include discussion of power dynamics, ideology, violence, conflict, realist perspectives, and critical perspectives.
Additional Information: Priority enrollment will be given to students in the MPS in Security and Terrorism Studies program.

BSST641 U.S. Security Infrastructure (3 Credits)
An overview of the federal departments and agencies whose core missions are to provide for security and prevent terrorism. The course will overview the Departments of Defense, State, Treasury, Homeland Security, and the U.S. Intelligence Community as well as state, local, and tribal assets, and think tanks and the media, to provide students with a better understanding of interagency successes and gaps.

BSST642 Analytic Methods (3 Credits)
Development and mastery of analytic methods is vital for those seeking careers as professional analysts in fields related to security and terrorism studies. For students focused on an academic research career path, these skills will help you better interface with government and private sector consumers of your work. The overall goals for this course are to provide students with hands-on experience using analytic techniques to solve advanced problems. Classes will cover historical and current uses of analytic techniques and students will develop an understanding of which tools to use under different circumstances of analysis.

BSST643 Great Powers & Near-Peer Competition (3 Credits)
Focused on the emerging threats posed by state actors termed as "near-peers," including topics germane to near-peer competitors, most notably China, Russia, and Iran, but will cover other state actors as necessary. The course also investigates the past, present, and future of the most powerful states in the international system, the great powers, and how they compete, and cooperate in international relations. By examining the various aspects of the great powers and near-peer competitors, students will learn how geography, politics, economics, technology, and ideology play a role in global competition.

BSST645 Non-state Actors Threats and Responses (3 Credits)
The Non-State Actor. Running the gamut from Freedom fighters to Corporatized extortionists, NSAs play a pivotal role in the modern fields of combat. Some maintain loose state-level ties with high deniability, others rage against their domestic governments and facilitate foreign influence, but all present a modern adversary that Western Allies and Governments need to anticipate, track, and overcome. This course will provide an overview of the types of non-state actors that influence state actions. The course will examine the economic, political, and social costs of the proliferation of non-state actors globally. While the course will discuss terrorist groups, the main focus of the course will be on actors such as militant groups, insurgent groups, drug cartels, and illicit financial actors.

BSST650 Foundations of Insider Risk Management & Mitigation (3 Credits)
The risks posed by trusted insiders to organizations in both the public and private sector are well documented. Past compromises of national security information have provided sensitive information to US adversaries; theft or compromise of proprietary data and intellectual property has impacted businesses large and small; and, incidents of workplace violence perpetrated by insiders are on the rise. This course provides context for the counter insider threat mission and explores multi-disciplinary insider risk management concepts. The course addresses matters of policy, political and socio-economic impacts, psychological factors, and gives special consideration to issues of cyber insider threat, privacy and civil liberties, kinetic violence, and related social and behavioral science research.

BSST651 The Psychology of Malicious Insiders (3 Credits)
Multidisciplinary perspectives on intentional, malicious behavior by insiders. Reviews theoretical foundations from social psychology, personality psychology, psychopathology, and criminology and encourages students to understand Insider Threat (InT) behaviors through case conceptualization/formulation. Emphasis shall be placed on understanding the "fit" between different strategies for interviewing, investigating, early warning, monitoring, and mitigation, as well as the dynamics of a given case.

BSST652 Managing Insider Threat Activities (3 Credits)
Introduces critical concepts in threat assessment, management, and mitigation. Specifically, the seminar will highlight key concepts, theories, best practices, and research in three major areas of focus: (1) threat assessment and risk management, (2) mitigating existing risk and preventing further escalation, and (3) oversight and accountability of threat assessment activities.

BSST653 Investigative Thinking, Analysis and Decision-making in Insider Risk Management & Mitigation (3 Credits)
The purpose of this course is to stimulate "knowledge opportunity" in the complex everyday subject of decision making in insider threat analysis. Through the discovery of investigative thinking and some of its core elements of critical thinking, data to knowledge process, communication, heuristic, bias, and thinking processes, it is hoped it will lead students towards a better understanding of "What they are looking for" and "What they are looking at," both key elements essential in sound investigative thinking.

BSST697 Capstone (3 Credits)
The capstone course allows MPS students the ability to take what they have learned throughout their coursework and apply theories, methods, analysis, and policy in the form of a final project. The project can originate from work experience or the student's interests. Projects will be developed in conjunction with a member of the graduate faculty who will oversee the student's progress. By the end of the semester, each student is expected to have completed their individual project. The project should further the student's intellectual and career goals and can take the form of practical analysis, policy, or a more academic approach. Students will present their capstone project in written form and will also be required to present their research via an online colloquium. Students are expected to meet with a capstone advisor at least once a week and will devote considerable time developing the project individually.
Restriction: Students must be currently enrolled in their final semester of the MPTS program and have completed a minimum of 27 program credits.

BSST698 Seminar in Terrorism Studies (1-3 Credits)
A special topics seminar course for graduate students interested in terrorism studies.
Repeatable to: 9 credits if content differs.

BSST699 Independent Study in Terrorism Studies (3 Credits)
An independent study course for students in the Global Terrorism Minor program.
Repeatable to: 9 credits if content differs.

BUAC - Accounting and Information Assurance

BUAC602 Introduction to Financial Accounting (2 Credits)
Overview of financial accounting, periodic financial statements and the financial reporting process. Importance of financial statements as information source for creditors and investors and as a means by which managers can communicate information about their firms.
Restriction: Must be in Business and Management (Master's) program; or permission of BMGT-Robert H. Smith School of Business.
Credit Only Granted for: BUSI610, BUAC602, BUFN602, or BMGT602.

BUAC616 Introduction to Managerial Accounting (2 Credits)
Use of accounting data in corporate planning and control. Cost-volume-profit analysis, budgeting, pricing decisions and cost data, transfer pricing, activity-based management, performance measures, and standard costing.
Prerequisite: BUSI610.
Restriction: Must be in Business and Management (Master's) program; or permission of BMGT-Robert H. Smith School of Business.
Credit Only Granted for: BUSI611, BUAC616, or BMGT616.

BUAC701 Accounting Theory (3 Credits)
Examines GAAP, its weaknesses and strengths, and the role that the FASB and SEC play in its development. Includes the FASB standard setting process and issues that relate to this process: FASB conceptual framework; lobbying activity; and impending FASB standards. Other topics include: how management incentives and firm type influence accounting choice; recognize versus disclose as a strategy; and current debates in accounting. While the user of accounting information is examined, this course focuses more on management and how it reports and discloses accounting information.
Prerequisite: BMGT310, BMGT424, and BMGT311.
Credit Only Granted for: BMGT706 or BUAC701.
Formerly: BMGT706.

BUAC705 Advanced Financial Reporting (3 Credits)
Uses authoritative professional pronuncements to examine advanced financial reporting issues. Examines complex problems in accounting and reporting; examples include penisons, taxes, interest rate swaps, derivative securities, international transactions, and international financial reporting. Takes a user-oriented perspective, and examines the ways in which financial accounting information is used by investors, analysts, and creditors. Examples include if users adjust for alternative accounting methods or for information that is recognized versus disclosed.
Prerequisite: BMGT310, BMGT424, and BMGT311.
Credit Only Granted for: BMGT707 or BUAC705.
Formerly: BMGT707.

BUAC706 Business Ethics for Accountants and Auditors (2 Credits)
Considers all facets of business ethics issues within an accounting and auditing context. Ethical theory, corporate social responsibility, and individual decision-making are considered. Some of the applied topics that may be covered in this course include, but are not limited to, intellectual property issues, corporate downsizing, outsourcing, global ethics, crises management, and employment ethics.
Restriction: Must be in Business and Management (Master's) program.
Credit Only Granted for: BUAC765 or BUAC706.
Formerly: BUAC765.

BUAC707 Financial Statement Analysis for Accountants and Auditors (2 Credits)
Provides students with the tools to conduct a financial statement analysis, which is part of an overall business analysis. This involves understanding and using the information that financial statements are communicating to users.
Restriction: Must be in Business and Management (Master's) program; or permission of BMGT-Robert H. Smith School of Business.
Credit Only Granted for: BUAC780 or BUAC707.
Formerly: BUAC780.

BUAC710 Advanced Managerial Accounting and Control Systems (2 Credits)
Focuses on topics that emphasize the role of managerial accounting in a firm's overall management planning and control structure. A key concern is to show how effective organizations ensure that the parts of the organization work together to create the whole, and how the sum of the parts, through synergy, can indeed be greater then the whole.
Restriction: Must be in Business and Management (Master's) program; or permission of BMGT-Robert H. Smith School of Business.
Credit Only Granted for: BUAC782 or BUAC710.
Formerly: BUAC782.

BUAC711 Financial Planning and Control Systems for Managers and Consultants (2 Credits)
This course provides an analysis of several topics concerning financial planning/control systems (management accounting systems). Topics covered: design and use of cost management systems (including activity based costing systems), financial performance measures for enhancing firm value, managerial incentive contracts and accounting data, management accounting and Internet-based transactions, managing earnings and financial ratios, use of balanced scorecard to evaluate financial/nonfinancial managerial performance, management accounting systems and competitor analysis, behavioral aspects of budgeting, post-auditing of capital investments, accounting/economics aspects of information security, and transfer pricing.
Prerequisite: BUSI611, BUSI681, and BUSI630; or permission of BMGT-Robert H. Smith School of Business.
Restriction: Must be in one of the following programs (Business and Management (Master's); Business and Management (Master's)).
Credit Only Granted for: BMGT711 and BUAC711.
Formerly: BMGT711.

BUAC712 Business Communications for Accountants and Auditors (2 Credits)
Focuses on the art of communication and its effects on people, organizations, and other stakeholders. The course will focus on two aspects of business communications: persuasion and effective presentations. The objective for the persuasion sessions is to have students improve upon their day-to-day oral business communications skills. This will be accomplished as participants learn to tailor each communication to the person or people with whom they are speaking.
Restriction: Must be in Business and Management (Master's) program; or permission of BMGT-Robert H. Smith School of Business.
Credit Only Granted for: BUAC784 or BUAC712.
Formerly: BUAC784.

BUAC713 The Impact of Taxation on Business Decisions (3 Credits)
The impact of tax law and regulations on alternative strategies with particular emphasis on the large, multidivisional firm. Problems of acquisitions, mergers, spinoffs, and other divestitures from the viewpoint of profit planning, cash flow, and tax deferment.
Prerequisite: BUSI611.
Credit Only Granted for: BMGT713 or BUAC713.
Formerly: BMGT713.

BUAC714 Forensic Accounting/Auditing (2 Credits)
Provides a theoretical background and practical application of fraud examinations and corporate investigations. Fraud prevention, detection, investigation, and related matters such as courtroom procedures will be included. Also considered are topics such as FCPA and securities fraud. A wide variety of teaching tools are used.
Restriction: Must be in Business and Management (Master's) program; or permission of BMGT-Robert H. Smith School of Business.
Credit Only Granted for: BUAC792 or BUAC714.
Formerly: BUAC792.

BUAC716 Auditing Automation and Analytics (2 Credits)
Auditing theory and the functions of the independent auditor in the financial market. As part of the class, the students will cover issues related to auditing large databases and audit analytics of large database. Moreover, the students will study audit automation and the use of artificial intelligence (AI) and Robotic process in the auditing market.
Restriction: Must be in Business and Management (Master's) program; or permission of BMGT-Robert H Smith.

BUAC717 Enterprise Risk Management (2 Credits)
Enterprise Risk Management, ERM, involves the study of the processes employed in identifying and assessing the risks and opportunities companies face, developing and implementing a plan to address those risks and opportunities, and monitoring progress implementing the plan. ERM is used to understand, control, and articulate the nature and level of risks taken in pursuit of business strategies coupled with accountability for risks taken and activities engaged in. One major benefit of ERM is that it provides an enhanced perspective and focus on risk management across the institution. The course will provide the opportunity to identify and discuss the issues and challenges in total risk management and will explore techniques for balancing enterprise risk and reward to optimize an organization's performance.
Restriction: Must be in Business and Management (Master's) program; or permission of BMGT-Robert H. Smith School of Business.
Credit Only Granted for: BUAC758J or BUAC717.
Formerly: BUAC758J.

BUAC721 Business Law for Managers (2 Credits)
Survey of United States legal institutions and processes as well as substantive areas of the law that affect business. Examination of tort and contract law, the legal forms of business organization and legal liability and major regulatory laws that affect business.
Restriction: Must be in Business and Management (Master's) program; or permission of BMGT-Robert H. Smith School of Business.
Credit Only Granted for: BUSI764 or BUAC721.

BUAC722 Applied Research for Accounting and Auditing (2 Credits)
Designed to give accounting masters students exposure to and appreciation of the various types of research that are undertaken by accounting and auditing professionals, including CPAs, financial analysts and academics. Accounting research will be studied as it relates to financial accounting standards, auditing standards, gaining understanding of a business and industry, and to a very limited extent tax and academic research. Students will gain experience working with professional accounting research databases as well as other databases that are useful for accounting research. Auditors and corporate preparers of financial statements need to know how to determine current GAAP and GAAS as they confront new issues and as standards evolve and change. Professionals need to understand how the standards are derived and how to analyze policy alternatives. Additionally, students will also explore the process of researching a business or industry in preparation for an audit.
Restriction: Must be in Business and Management (Master's) program; or permission of BMGT-Robert H Smith.

BUAC723 Essentials of Negotiation (2 Credits)
This highly experiential course will improve students' negotiation skills and capacity to acquire and effectively use bargaining power. By using a variety of assessment tools, feedback sources, skill-building exercises, and exercise debriefings, the class will increase students' negotiating self-confidence and improve their capacity to claim value and achieve win-win solutions to individual, team, and organizational problems. The course is designed to enhance students' negotiating self-confidence and improve students' analytical and decision-making skills (e.g., understanding bargaining zones, knowing when an agreement can be made and when to walk away; learning how to prepare for negotiations), interpersonal skills, creativity (e.g., identifying creative solutions to conflict), and persuasive abilities.
Restriction: Must be in Business and Management (Master's) program; or permission of BMGT-Robert H. Smith School of Business.
Credit Only Granted for: BUMO794 or BUAC723.
Formerly: BUMO794.

BUAC724 Research on Accounting and Economic Aspects of Cybersecurity (2 Credits)
Cybersecurity has also become a key priority for the field of accounting for at least two reasons. First, the reliability, integrity and validity of computer-based accounting systems are dependent on cybersecurity. Second, given their role as advisors to organizations, accounting firms play a critical role in helping to improve the cybersecurity of their clients' computer-based accounting systems. The primary objective of this course is to discuss the relationships among accounting, economics and cybersecurity, with a focus on the important roles of accounting and economics in understanding the issues related to cybersecurity in today's interconnected digital world. A secondary objective of the course is to assist MS in Accounting (MSA) students in developing their ability to conduct original and applied research on topics related to "accounting and economic aspects of cybersecurity."
Restriction: Must be in Business and Management (Master's) program; or permission of BMGT-Robert H Smith.

BUAC725 Leadership and Human Resource Management for Accountants and Auditors (2 Credits)
Develops the concepts, frameworks, and skills that are important to be effective leaders and to successfully manage human resources. Topics for discussion include: Creating a motivating and empowering environment; leadership attributes, power and effective influence; building effective decision-making; strategic management of human resources; specification of the skills and competencies requisite for job success; recruiting and selecting employees to fit the job and the organization; measuring, appraising and improving performance. All of the topics selected for discussion are critical ones that every professional needs to know, regardless of functional area (not just HR professionals), and will help students become more effective consultants, managers and leaders.
Restriction: Must be in Business and Management (Master's) program; or permission of BMGT-Robert H. Smith School of Business.
Credit Only Granted for: BUMO796 or BUAC725.
Formerly: BUMO796.

BUAC726 Advanced Accounting Systems (3 Credits)
A study of current information technologies and their interaction with accounting systems and the accounting profession. Topics include: systems analysis and design; databases; electronic commerce and data security; communications and image processing; and expert systems and decision support systems.
Prerequisite: BMGT326.
Credit Only Granted for: BMGT716 or BUAC726.
Formerly: BMGT716.

BUAC731 Intermediate Accounting I (2 Credits)
The first part of a three-series set of courses on intermediate accounting; presents an in-depth analysis of financial accounting and reporting theory and practice that will enhance student understanding of financial information used in making effective management decisions. For each topic included in the series, this course presents a review of the underlying business transactions that require accounting along with a review the technical details of U.S. Generally Accepted Accounting Principles (GAAP) and applicable International Financial Reporting Standards (IFRS). The course covers the informational needs of managers, securities analysts, investors and creditors, applicable to a variety of business transactions and events. The course includes materials helpful to students planning to take the CPA Examination. Intermediate Accounting I focuses on financial accounting standards, the conceptual framework of accounting, the accounting information system, the balance sheet, income statement, statement of cash flows, time value of money concepts and revenue recognition.
Restriction: Must be in Business and Management (Master's) program; or permission of BMGT-Robert H. Smith School of Business.
Credit Only Granted for: BUAC758L or BUAC731.
Formerly: BUAC758L.

BUAC732 Intermediate Accounting II (2 Credits)
Continuing the study of accounting information covering accounting principles found in US GAAP and IFRS as they apply to cash and receivables, inventory valuation, acquisition and disposition of plant, property and equipment, depreciation, impairments and depletion, intangible assets, current liabilities and contingencies, long-term liabilities, and stockholders equity.
Prerequisite: BUAC731.
Restriction: Must be in Business and Management (Master's) program; or permission of BMGT-Robert H. Smith School of Business.
Credit Only Granted for: BUAC758M or BUAC732.
Formerly: BUAC758M.

BUAC735 External Auditing (2 Credits)
The study of the independent accountants attest function, generally accepted auditing standards, compliance and substantive tests, and auditor reports and opinions. The course explores audit planning and the role of internal controls and their effect on the auditability of financial statements. The course includes the study of various audit concepts, including how auditors develop an audit strategy, determine materiality in various contexts, set the acceptable level of audit risk, assess control and inherent risk and set detection risk, develop audit objectives, accumulate audit evidence and prepare workpapers, and audit firm quality control.
Restriction: Must be in Business and Management (Master's) program; or permission of BMGT-Robert H. Smith School of Business.
Credit Only Granted for: BUAC758O or BUAC735.
Formerly: BUAC758O.

BUAC737 Financial Reporting for Executives (2 Credits)
Financial Reporting involves the study of how financial executives can meet their reporting obligations in communicating the financial performance of their companies. The course reviews the financial reporting requirements including those imposed by the Sarbanes Oxley Act on public companies that will fulfill the informational needs of various stakeholders, including investors, stockholders and creditors, the primary financial statement users, along with customers, employees, and regulators. The course examines techniques to effectively meet these informational requirements, including accounting for and disclosing transactions and events that affect the primary financial statements income statement, balance sheet, statement of stockholders equity and cash flow statement.
Restriction: Must be in Business and Management (Master's) program; or permission of BMGT-Robert H. Smith School of Business.
Credit Only Granted for: BUAC758R or BUAC737.
Formerly: BUAC758R.

BUAC740 Data Driven Decision Making (2 Credits)
Proficiency in the art of analyzing data to support decision-making is critical for business professionals. In this course, we will explore basic analytical principles that can assist a manager to extract information from raw data and model complex decision problems with quantitative methods. A good outcome does not necessary imply a good decision, a good outcome can be a matter of luck. A good decision is founded on sound reasoning and considers all the information available at the time of the decision.
Restriction: Must be in Business and Management (Master's) program; or permission of BMGT-Robert H Smith.

BUAC742 Accounting Analytics (2 Credits)
The application of data analytics techniques in accounting. Topics such as identifying questions that can be answered by data; data extraction, cleaning and preparation; data visualization; audit data analytics; generating key performance indicators; financial statement analytics; and tax analytics will be covered. Students will gain hands-on experience with various data analytics software. By the end of this course, the students should have a basic understanding on how accounting analytics can help enhance the effectiveness of management control systems and improve the quality and relevance of financial reporting, as well as its implications in auditing and fraud detection.
Restriction: Must be in Business and Management (Master's) program; or permission of BMGT-Robert H Smith.

BUAC743 Financial Statement Analysis (2 Credits)
Provides students with the tools to conduct a financial statement analysis, which is part of an overall business analysis. This involves understanding and using the information that financial statements are communicating to users.
Prerequisite: BUSI610.
Restriction: Must be in one of the following programs (Business and Management (Master's); Business and Management (Master's)) ; or permission of BMGT-Robert H. Smith School of Business.

BUAC744 Valuation Measurement, Reporting, and Auditing for Accountants and Auditors (2 Credits)
An introduction to valuation for financial reporting ("fair value"), fair value reporting, and auditing fair value measurements. The number and complexity of financial reporting standards that require or allow assets and liabilities to be reported at fair value has increased substantially in recent years. The technical accounting standards that include fair value are complex in and of themselves, and the valuation measurements add substantially to the complexity. Further complexity is added to the dynamic because the audit firm is prohibited by the AICPA's independence rules from performing the valuation or providing significant assistance in technical accounting or the fair value measurement. Independent valuation/appraisal specialists are frequently preferred or required by the reporting company and/or the audit firm. From the perspective of the reporting company, this frequently results in complex and costly compliance, and from the auditor's perspective, a complex and high-risk area of the audit.
Restriction: Must be in Business and Management (Master's) program; or permission of BMGT-Robert H Smith.

BUAC746 Systems for Data Analysis (2 Credits)
Since the data grows exponentially and becomes complex, we need computational methods to collect, store, and analyze them in order to be successful in business, management, science, engineering, and other professions. This course is an introductory data class that meets this need. Class teaches how to analyze and model data, how to define and manipulate database, how to write computer programs in Python language to solve real-world problems, and how to use Tableau to explain your results as a report in a more readable way. This will be useful in your career and your research in the future. This course introduces the conceptual and logical designs of relational database systems and their uses in business environments. Topics include information modeling, optimization via normalization, data definition and manipulation languages, client/server architectures, concurrency and recovery, and data warehousing.
Restriction: Must be in Business and Management (Master's) program; or permission of BMGT-Robert H Smith School of Business.
Credit Only Granted for: BUAC758S or BUAC746.
Formerly: BUAC758S.

BUAC750 Research and Internship in Accounting (3 Credits)
Completion of a research paper on an approved accounting topic. Supervised sponsored internship in an entity outside the University.
Prerequisite: Permission of BMGT-Robert H. Smith School of Business.
Credit Only Granted for: BMGT717 or BUAC750.
Formerly: BMGT717.

BUAC752 Internal Auditing I: Assurance and Consulting Services (2 Credits)
Provides students with an overview and basic understanding of internal auditing. Internal audit's role in internal control, risk management, business processes and risks, and Sarbanes-Oxley, Section 404 compliance efforts compliance efforts are considered. Internal auditing is presented as an integral part of effective corporate governance. Examples of assurance and consulting activities undertaken by the internal audit function, as well as the sourcing strategy (i.e., full insourcing, co-sourcing or full outsourcing models) are discussed. Students are introduced to internal control theory, test design concepts and internal auditing best practices.
Restriction: Must be in Business and Management (Master's) program; or permission of BMGT-Robert H Smith School of Business.
Credit Only Granted for: BUAC786 or BUAC752.
Formerly: BUAC786.

BUAC754 Internal Auditing II: Internal Audit Application and Practice (2 Credits)
This advanced internal auditing course contains an in-depth coverage of the internal audit process. Students receive experience in planning and conducting internal audit assurance and consulting engagements. Also, students build on the theory and techniques introduced in Internal Auditing I, through practical, in-depth coverage of specific audit areas. Other matters covered include audit evidence, workpapers, audit sampling, and communicating of engagement results. Internal auditing case studies are used to reinforce the learning process.
Prerequisite: BUAC786; or BUAC752.
Restriction: Must be in Business and Management (Master's) program; or permission of BMGT-Robert H. Smith School of Business.
Credit Only Granted for: BUAC787 or BUAC754.
Formerly: BUAC787.

BUAC756 Informtion Security, Audit and Control (2 Credits)
Builds on basic information technology (IT) courses, focusing on key issues including IT security, IT controls, and IT auditing. Addressing issues such as auditing a computer information system; assessing risks; identifying control objectives; identifying appropriate audit procedures; learning the concepts and basic features or audit software thereby providing the tools for choosing audit software; conducting an operational audit basic controls over computer information systems; and developing world-class IT control frameworks.
Restriction: Must be in Business and Management (Master's) program; or permission of BMGT-Robert H. Smith School of Business.
Credit Only Granted for: BUAC790 or BUAC756.
Formerly: BUAC790.

BUAC758 Special Topics in Accounting and Information Assurance (1-3 Credits)
Selected advanced topics in the various fields of graduate study in accounting and information assurance.
Repeatable to: 9 credits if content differs.
Formerly: BMGT798.

BUAC759 Independent Study in Accounting and Information Assurance (1-6 Credits)
Independent study for masters students in accounting and information assurance.
Repeatable to: 6 credits if content differs.
Formerly: BMGT708.

BUAC762 Tax I: Taxation of Individuals & Forecasting Analytics (2 Credits)
Federal taxation of individuals focusing on income, exclusions, deductions, depreciation, credits and capital transactions including home ownership. Property coverage includes the tax consequences of sales and dispositions of personal use assets, investment and business assets. Both tax planning and compliance issues are also covered. In addition the course covers waged based and equity-based compensation, taxable and nontaxable benefits as well as deferred compensation and various retirement plans. In addition, students will learn how to utilize regression analysis and scenario analysis to provide additional insights about these tax topics and to forecast future effective tax rates.
Restriction: Must be in Business and Management (Master's) program; or permission of BMGT-Robert H Smith School of Business.

BUAC764 Tax II: Taxation of Corporations & Other Entities (2 Credits)
Students have the opportunity to gain an understanding of the basic tax competencies required for determining the appropriate tax structure for businesses; issue identification; active listening; solving tax problems.
Restriction: Must be in Business and Management (Master's) program; or permission of BMGT-Robert H. Smith School of Business.
Credit Only Granted for: BUAC758V or BUAC764.
Formerly: BUAC758V.

BUAC765 Business Ethics for Accountants and Auditors (3 Credits)
Considers all facets of business ethics issues within an accounting and auditing context. Ethical theory, corporate social responsibility, and individual decision-making are considered. Some of the applied topics that may be covered in this course include, but are not limited to, intellectual property issues, corporate downsizing, outsourcing, global ethics, crises management, and employment ethics.
Restriction: Must be in Business and Management (Master's) program.
Credit Only Granted for: BUAC765 or BUAC706.

BUAC766 Data Security and Taxation of Not-for-Profit Entities (2 Credits)
An introduction to the theory and practice of taxation as applied in the nonprofit sector. The practice of taxation for nonprofits requires, inter alia, an understanding of the legal framework for these entities. Therefore, the course will devote significant time to understanding the legal environment and framework associated with nonprofits. We will also discuss the related issues of data security and cybersecurity. The course goal is to enable students to become proficient in the major aspects of nonprofits that apply to the work of public accountants.
Restriction: Must be in Business and Management (Master's) program; or permission of BMGT-Robert H Smith School of Business.

BUAC767 Tax IV: Real Estate Taxation (2 Credits)
Provides an in-depth examination of the tax provisions and opportunities for planning transactions that involve real estate investments and transactions. The course covers the tax implications of purchasing, holding, and selling real property. These include the determination of tax basis and the treatment of mortgage interest, property taxes, like-kind exchanges, involuntary conversions, sales and dispositions, qualifying property, and capital gains and losses. The various forms used for property transactions will be reviewed in detail.
Restriction: Must be in Business and Management (Master's) program; or permission of BMGT-Robert H. Smith School of Business.
Credit Only Granted for: BUAC758X or BUAC767.
Formerly: BUAC758X.

BUAC770 Tax V: Visual Analytics and International Tax (2 Credits)
An introduction to the theory and practice of international taxation. The objective of the course is to provide students with the basic tools to approach international tax topics from a US perspective. The course addresses the fundamentals of U.S. international taxation, but also offers insight into tax planning considerations. Both the U.S. activities of foreign taxpayers, as well as the foreign activities of U.S. taxpayers are explored. In addition, students will pull data from several sources into a visual analytics software environment and then manipulate the data into a visual front end.
Restriction: Must be in Business and Management (Master's) program; or permission of BMGT-Robert H Smith School of Business.

BUAC772 Database Management and State and Local Taxation (2 Credits)
Covers the tax implications of doing business in the United States across state lines, resulting in multiple taxation under the Commerce Clause of the United States Constitution. The course focuses on nexus or jurisdictional due process (which gives states the right to tax business profits), allocation and apportionment formulas of multi state income, business versus non-business income, privilege tax and discrimination. Also explored are the current tax developments under the Import-Export clause of the United States Constitution, taxation based on class legislation and the Equal Protection Clause, the multi-state tax compact, unitary concept, residence definitions, nonresident income sources, tax credits and short-period returns for individual income taxpayers, sales of tangible personal property, and retail and wholesale sales. The course examines valuation techniques for real and personal property. Students will learn the skills needed to understand and identify many aspects of the state income tax apportionment process. Focus will be placed on calculations and analyses required to present the state and local tax information in such a manner as to assist upper management in the business expansion decision-making process. The tax apportionment process requires a solid understanding of database management and we will utilize tools that are considered required knowledge in today's tax departments.
Restriction: Must be in Business and Management (Master's) program; or permission of BMGT-Robert H Smith School of Business.

BUAC774 Tax VII: Estates, Trusts, & Personal Finance Planning (2 Credits)
Covers the general tax considerations impacting estates and trusts. Includes an overview of the estate transfer tax and gift tax regime, in order to provide context to estate and trust income taxation. In addition, the course will cover how estates, trusts, and beneficiaries are taxed, and analyze some common estate planning techniques using trusts, including charitable trusts, grantor retained annuity trusts (GRATs), defective grantor trusts, valuation discounts, and other tax planning concepts.
Restriction: Must be in Business and Management (Master's) program; or permission of BMGT-Robert H. Smith School of Business.

BUAC780 Financial Statement Analysis for Accountants and Auditors (3 Credits)
Provides a framework for using a firm's financial statements to perform a comprehensive analysis of the firm's operating performance, cash management, and financial position as well as to value the firm and to detect earning management. It includes an overview of the accounting and auditing standard setting framework, and the relevance of U.S. GAAP as well as International Financial Reporting Standards (IFRS) to accounting recognition, measurement, presentation, and disclosure. The course also identifies the analytical relevance of a selected set of more advanced accounting topics (e.g., valuing employee stock options).
Restriction: Must be in Business and Management (Master's) program.
Credit Only Granted for: BUAC780 or BUAC707.

BUAC782 Advanced Managerial Accounting and Control Systems (3 Credits)
Focuses on topics that emphasize the role of managerial accounting in a firm's overall management planning and control structure. A key concern is to show how effective organizations ensure that the parts of the organization work together to create the whole, and how the sum of the parts, through synergy, can indeed be greater then the whole.
Restriction: Must be in Business and Management (Master's) program.
Credit Only Granted for: BUAC782 or BUAC710.

BUAC784 Business Communications for Accountants and Auditors (2 Credits)
Focuses on the art of communication and its effects on people, organizations, and other stakeholders. The course will focus on two aspects of business communications: persuasion and effective presentations. The objective for the persuasion sessions is to have students improve upon their day-to-day oral business communications skills. This will be accomplished as participants learn to tailor each communication to the person or people with whom they are speaking.
Restriction: Must be in Business and Management (Master's) program.
Credit Only Granted for: BUAC784 or BUAC712.

BUAC786 Internal Auditing I: Conceptual and Institutional Framework (3 Credits)
Provides students with an overview and basic understanding of internal auditing. Internal audit's role in internal control, risk management, business processes and risks, and Sarbanes-Oxley, Section 404 compliance efforts compliance efforts are considered. Internal auditing is presented as an integral part of effective corporate governance. Examples of assurance and consulting activities undertaken by the internal audit function, as well as the sourcing strategy (i.e., full insourcing, co-sourcing or full outsourcing models) are discussed. Students are introduced to internal control theory, test design concepts and internal auditing best practices.
Restriction: Must be in Business and Management (Master's) program.
Credit Only Granted for: BUAC786 or BUAC752.

BUAC787 Internal Auditing II: Internal Audit Application and Practice (3 Credits)
This advanced internal auditing course contains an in-depth coverage of the internal audit process. Students receive experience in planning and conducting internal audit assurance and consulting engagements. Also, students build on the theory and techniques introduced in Internal Auditing I, through practical, in-depth coverage of specific audit areas. Other matters covered include audit evidence, workpapers, audit sampling, and communicating of engagement results. Internal auditing case studies are used to reinforce the learning process.
Prerequisite: BUAC786.
Restriction: Must be in Business and Management (Master's) program.
Credit Only Granted for: BUAC787 or BUAC754.

BUAC788 Action Learning Project (1-2 Credits)
A significant consulting project within teams, designed by individual MS student participants and faculty. It may also be an individual project/study or a business simulation exercise.
Restriction: Must be in Business and Management (Master's) program.
Repeatable to: 2 credits if content differs.

BUAC790 Informtion Security, Audit and Control (3 Credits)
Builds on basic information technology (IT) courses, focusing on key issues including IT security, IT controls, and IT auditing. Addressing issues such as auditing a computer information system; assessing risks; identifying control objectives; identifying appropriate audit procedures; learning the concepts and basic features or audit software thereby providing the tools for choosing audit software; conducting an operational audit basic controls over computer information systems; and developing world-class IT control frameworks.
Restriction: Must be in Business and Management (Master's) program.
Credit Only Granted for: BUAC790 or BUAC756.

BUAC792 Forensic Accounting/Auditing (3 Credits)
Provides a theoretical background and practical application of fraud examinations and corporate investigations. Fraud prevention, detection, investigation, and related matters such as courtroom procedures will be included. Also considered are topics such as FCPA and securities fraud. A wide variety of teaching tools are used.
Restriction: Must be in Business and Management (Master's) program.
Credit Only Granted for: BUAC792 or BUAC714.

BUDT - Decision and Information Technologies

BUDT700 Business Communication (1 Credit)
Consists of written and oral base-line assessments. Students will meet with Program administrators to receive feedback on these assessments and create an individualized development plan. Workshops and core course assignments, Smith-related activities and CMP assignments.
Restriction: Must be in Business and Management (Master's) program; or permission of BMGT-Robert H Smith School of Business.
Credit Only Granted for: BUDT758A or BUDT700.
Formerly: BUDT758A.

BUDT702 Database Management Systems (2 Credits)
Introduction to the conceptual, logical and physical design of relational database systems and their use in business environments. Topics include information modeling and optimization via normalization; Structured Query Language (SQL); Data Warehousing.
Restriction: Must be in Business and Management (Master's) program; or permission of BMGT-Robert H Smith School of Business.

BUDT703 Database Management Systems (3 Credits)
Introduction to the conceptual, logical and physical design of relational database systems and their use in business environments. Topics include information modeling and optimization via normalization; Structured Query Language (SQL); Data Warehousing.
Restriction: Must be in Business and Management (Master's) program; or permission of BMGT-Robert H Smith School of Business.
Credit Only Granted for: BUDT758Y OR BUDT703.
Formerly: BUDT758Y.

BUDT704 AI Augmented Data Processing and Analysis (3 Credits)
This course provides a comprehensive introduction to the world of data programming with Python, augmented by the power of Artificial Intelligence (AI). Designed for beginners, this course will equip students with the essential skills to analyze data, automate tasks, and build intelligent applications. Students will learn fundamental Python programming concepts, explore AI algorithms and techniques, and gain practical experience working with real-world data. Through hands-on labs and projects, students will discover how to leverage AI to extract meaningful insights from data, build AI-powered tools, and develop a deeper understanding of the growing role of AI in data science. No prior programming experience is required.
Restriction: Must be admitted to the appropriate graduate business program; or permission of the Masters Programs Office at the Robert H. Smith School of Business.

BUDT705 Data Visualization for Business (2 Credits)
An introduction to data visualization techniques. Data-driven decisions are increasingly embedded in business organizations, so professionals must be able to explore and communicate data with understandable and powerful visualizations.
Restriction: Must be in Business and Management (Master's) program; or permission of BMGT-Robert H Smith.

BUDT706 Social Media and Unstructured Data Analytics (2 Credits)
Firms operate in a world that is rapidly changing. Traditional product and service strategies are not sufficient when firms and consumers operate in a highly networked environment. Adoption of digital technologies is changing consumer behaviors and firms' competitive landscapes. Businesses need to craft strategies that leverage the vast amounts of data provided by the digital footprints of their customers. Predictive analytics, particularly social media and unstructured data analytics can provide clear, insightful, and actionable initiatives leveraging existing company data and data gathered from online channels and platforms. The course on social media and unstructured data analytics provides the conceptual understanding and analytical skills needed for businesses to succeed in today's rapidly changing environment. We will review concepts related to platforms, social media, network analytics and text analytics, and examine issues associated with business use of these technologies.
Restriction: Must be in Business and Management (Master's) program; or permission of BMGT-Robert H Smith School of Business.

BUDT721 Digital Transformation in Business (2 Credits)
Introduces students to the strategic role of digital transformation within businesses, and provides an overview for how major information technologies may be used to inform and transform the firm's strategic, operational, and tactical decisions. Topics discussed in the course include the strategic use of digital technologies to generate sustainable competitive value; the contributions of new forms of technology infrastructure; the evaluation of new technology investments and the resulting ROI; acquiring, managing and governing technological capabilities within the firm; understanding the role of enterprise systems and social technologies within the firm; and the management of disruptive technologies within and outside the firm.
Restriction: Must be in Business and Management (Master's) program; or permission of BMGT-Robert H Smith School of Business.
Credit Only Granted for: BUDT758E or BUDT721.
Formerly: BUDT758E.

BUDT722 Managing Digital Business Markets (2 Credits)
The objective is to understand the strategic and tactical issues involved in managing digital businesses and markets. Also, some of the characteristics of digital businesses and markets that make them unique and understand how companies can best manage them will be examined.
Restriction: Must be in Business and Management (Master's) program; or permission of BMGT-Robert H Smith.
Credit Only Granted for: BUDT758G or BUDT722.
Formerly: BUDT758G.

BUDT723 Business Process Analysis for IS (2 Credits)
Helps students gain a solid foundation in the concepts, processes, tools, and techniques needed in analyzing business processes and conducting information systems projects.
Restriction: Must be in Business and Management (Master's) program; or permission of BMGT-Robert H Smith.

BUDT724 Project Management in Dynamic Environments (2 Credits)
Addresses project management skills that are required by successful managers in increasingly competitive and faster-moving environments. Examines fundamental concepts of successful project management, and the technical and managerial issues, methods, and techniques.
Restriction: Must be in Business and Management (Master's) program; or permission of BMGT-Robert H Smith.

BUDT730 Data Models and Decisions (3 Credits)
Analytical modeling of business decisions; uncertainty, risk and expected utility; regression modeling to infer relationships among variables.
Restriction: Must be in Business and Management (Master's) program; or permission of BMGT-Robert H Smith.
Credit Only Granted for: BUSI758B, BUDT758Q or BUDT730.
Formerly: BUDT758Q.

BUDT731 Data, Models, and Decisions Using R (2 Credits)
Analytical modeling of business decisions; uncertainty, risk and expected utility; regression modeling to infer relationships among variables.
Restriction: Must be in Business and Management (Master's) program; or permission of BMGT-Robert H Smith School of Business.

BUDT732 Decision Analytics (3 Credits)
Analytical modeling for managerial decisions using a spreadsheet environment. Includes linear and nonlinear optimization models, decision making under uncertainty and simulation models.
Restriction: Must be in Business and Management (Master's) program; or permission of BMGT-Robert H Smith.
Credit Only Granted for: BMGT732, BUDT758P or BUDT732.
Formerly: BMGT732 and BUDT758P.

BUDT733 Data Mining and Predictive Analytics (2 Credits)
With vast quantities of data being generated, including new types of data such as web traffic, social network data, and reviews and comments on websites, "big data" and "analytics" are important topics. Data, when used correctly, can create a competitive edge for firms. Advances in computing hardware and algorithms have improved the quality of predictions and effectiveness of predictive business applications. Expertise in working with data, and deep knowledge of data mining/machine learning methods, is a sought-after skill. This course introduces key tools and techniques of data mining: classification, prediction, cluster analysis, and text mining. The methods covered are linear and logistic regression, k-nearest neighbors, naive Bayes, classification and regression trees, ensemble methods, neural networks, k-Means and hierarchical clustering, and association rules. The course will focus on business applications, with examples from Marketing, Finance, Healthcare, and Operations.
Restriction: Must be in Business and Management (Master's) program; or permission of BMGT-Robert H Smith School of Business.

BUDT734 Data Mining and Predictive Analytics (3 Credits)
Data-driven decision-making is a key competitive advantage in today's business landscape. This course provides a foundational introduction to machine learning techniques and algorithms, equipping students with analytical and software tools to extract insights and create value from data. The course mainly focuses on predictive analytics methods, including linear models, decision trees, nearest neighbor classifiers, boosting, random forests, neural networks, probabilistic models, text analysis, complexity control, regularization, and model evaluation. Additionally, students will explore unsupervised learning techniques such as clustering, collaborative filtering, and dimensionality reduction, with applications in customer segmentation and recommender systems. Through real-world business examples, students will gain hands-on experience using Python in applying machine learning to marketing, forecasting and operations domain.
Restriction: Must be admitted to the appropriate graduate business program; or permission of the Masters Programs Office at the Robert H. Smith School of Business.

BUDT738 Industry Seminar (0 Credits)
This experiential course will be offered in the Fall and Spring Semester of the first year to provide students exposure to career paths, real-world technology challenges faced by business and how these challenges are overcome. UMD Smith alumni will host weekly interactive learning discussions.
Restriction: Must be in Business and Management (Master's) program; or permission of BMGT-Robert H Smith School of Business.
Repeatable to: 0 credit.

BUDT740 Management of Information Systems (3 Credits)
To work together effectively for an organization's success, both business managers and IS managers must understand how to both manage and utilize information systems. This course explores management issues and opportunities of the IS function within organizations. Topics include e-business, protection of intellectual property and personal information, software development, IS operations, systems availability and business continuity, IS for multinational organizations, shadow IS organizations, business partnerships and alliances, and mergers, acquisitions, and divestitures.
Restriction: Must be in Business and Management (Master's) program; or permission of BMGT-Robert H Smith.
Credit Only Granted for: BUDT758J or BUDT740.
Formerly: BUDT758J.

BUDT741 Digital Health (2 Credits)
Healthcare is perhaps the latest industry to use technology to innovate and automate its business processes. The focus of the course is to provide a deep understanding to the current and emerging technologies in the healthcare industry. The course will also discuss the vagaries of healthcare data and the analytics techniques that are specific to the healthcare industry.
Restriction: Must be in Business and Management (Master's) program; or permission of BMGT-Robert H Smith.
Credit Only Granted for: BUDT758M or BUDT741.
Formerly: BUDT758M.

BUDT742 Machine Learning & Blockchain for FinTech (2 Credits)
Machine Learning is rapidly changing the financial services industries and Blockchain is poised to make fundamental changes to how the financial sector is structured and organized. The focus of the course is to provide a deep understanding for the current machine learning and emerging Blockchain technologies in the financial services industry.
Restriction: Must be in Business and Management (Master's) program; or permission of BMGT-Robert H Smith.
Credit Only Granted for: BUDT758I or BUDT742.
Formerly: BUDT758I.

BUDT744 Operations Analytics (2 Credits)
A firm can create competitive advantage through the efficient management of its operations. To do so, the firm must recognize and establish the strategic role of its operations within the organization. At the more detailed operational level, the firm must execute effectively and efficiently using data, mathematical models, and other quantitative tools. This course offers analytical tools and techniques that the firm can use for execution. We cover key concepts and tools of operations and supply chain analytics, including process and bottleneck analysis, capacity and aggregate planning, waiting line management, inventory models, risk pooling, distribution planning, and facility location and network design. These concepts and tools will be applied to both manufacturing and service operations problems.
Restriction: Must be admitted to the appropriate graduate business program; or permission of the Masters Programs Office at the Robert H. Smith School of Business.

BUDT748 Industry Practicum (3 Credits)
This capstone course will provide students an opportunity to work on a real-world project where they will work with a company to use technology to solve a business problem.
Restriction: Must be in Business and Management (Master's) program; or permission of BMGT-Robert H Smith School of Business.

BUDT751 Harnessing AI for Business (2 Credits)
Artificial Intelligence (AI) is penetrating our daily routines deeply and is revolutionizing almost every aspect of business. Firms are increasingly using technologies such as natural language processing, neural networks, and deep learning to generate deep insights. At the same time, AI algorithms are challenged by issues of bias, ethics, and transparency. This course aims to equip students with the essential knowledge of the current wave of AI. It uses a hands-on, learning-by-doing approach to understanding the concepts behind AI, the strategic drivers of these technologies and the value propositions that they provide to industries. The focus is on creating awareness of the technologies, allowing some level of familiarity with them through assignments, and enabling some strategic thinking around the use of these in business.
Restriction: Must be in Business and Management (Master's) program; or permission of BMGT-Robert H Smith School of Business.

BUDT753 Blockchain Technologies and Business Applications (2 Credits)
Creates a strong business and technical foundation for Blockchain, starting with an in-depth discussion of the business inefficiencies that the Blockchain technology has the potential to address. This is followed by reviewing the computer science fundamentals related to cryptology, distributed computing, and peer-to-peer architectures that Blockchain systems rely on. The course then provides a comprehensive understanding of Bitcoin including its limitations, and the work that has been done to date to address these limitations. Alternate Blockchain implementations such as Ethereum and Hyperledger are discussed with a focus on smart contracts. The course will also cover potential business applications in Finance, Healthcare, Supply Chain, and Arts/Media/Entertainment. Students will be exposed to current research problems and research efforts in progress.
Restriction: Must be in Business and Management (Master's) program; or permission of BMGT-Robert H Smith School of Business.

BUDT754 IoT Applications for Business (2 Credits)
The IoT is enabling the digitization and internet connectivity of most physical things. The focus of this course is to provide students an in-depth understanding of the technology components of the IoT architecture, infrastructure, data and analytics so that they are equipped to develop business applications using IoT that deliver business outcomes.
Restriction: Must be in Business and Management (Master's) program; or permission of BMGT-Robert H Smith School of Business.

BUDT755 Applied Finance Information Systems (2 Credits)
There has been an explosion in the volume, velocity, and variety of financial data in the last decade. Most financial institutions have automated their processes and digitized their solutions. This has generated a healthy demand for professionals from a variety of fields who not only use cutting edge technologies but also understand financial terminology and concepts. The focus of the course is to introduce students to financial concepts, provide relevant background in the financial industry and teach them the basics of putting together multi-asset portfolios using stocks, bonds, commodities and options instruments. The course requires no background in finance; it uses a practical approach to understanding financial concepts using various open-source technologies such as Python. The IT know-how required for this course is prior experience with Python.
Restriction: Must be admitted to the appropriate graduate business program; or permission of the Masters Programs Office at the Robert H. Smith School of Business.

BUDT756 Causal Inference & A/B Testing (2 Credits)
Organizations and policymakers in government constantly grapple with such causal questions. For example, firms want to know how does a price change affect the sales of a product, or how to design websites and platforms that increase consumer engagement and lead generation; political parties want to know what on social media sites can boost their political influence, and governments want to know whether allowing parents to pay for private schools using publicly funded vouchers make the education system more effective. In particular, platforms such as Netflix, Airbnb, eBay, Groupon, Booking.com, Uber, Amazon, etc. make extensive and continuous use of A/B tests and have a dedicated team of data scientists and IT-personnel to implement, monitor and analyze such tests. Banks and Insurance companies constitute another important sector where the use of A/B testing is ubiquitous.
Restriction: Must be in Business and Management (Master's) program; or permission of BMGT-Robert H Smith School of Business.

BUDT757 Cybersecurity (2 Credits)
Distributed technologies and the ability of business to capture increasing amounts of sensitive data have increases the stakes and risks for information security. The focus of this course will be to help students understand cybersecurity frameworks, analytic techniques and enterprise risk management.
Restriction: Must be in Business and Management (Master's) program; or permission of BMGT-Robert H Smith School of Business.

BUDT758 Special Topics in Decision, Operations and Information Technologies (1-4 Credits)
Selected advanced topics in the various fields of graduate study in decision, operations and information technologies.
Restriction: Permission of BMGT-Robert H. Smith School of Business.
Repeatable to: 9 credits if content differs.
Formerly: BMGT798.

BUDT759 Independent Study in Decision and Information Technologies (1-6 Credits)
Independent study for masters students in decision and information technologies.
Repeatable to: 6 credits if content differs.
Formerly: BMGT708.

BUDT770 Capstone Project in Business Analytics (3 Credits)
The capstone course in the MSBA program provides students in the program with an opportunity to work with a company or an organization on a real-world business analytics challenge. The students will work in teams comprised of MSBA program colleagues to add value to the sponsoring organization. Students will enhance skills in analytics project management and related business issues and improve teamwork skills.
Restriction: Must be in Business and Management (Master's) program; or permission of BMGT-Robert H Smith School of Business.
Credit Only Granted for: BUDT758W or BUDT770.
Formerly: BUDT758W.

BUDT775 Pricing and Revenue Management (2 Credits)
Specialized course on pricing and revenue management (PRM) that provides students with tools and principles, drawn from several disciplines (Operations, Microeconomics, Decision Modeling, Statistics, Marketing, IS) to make effective pricing decisions. Topics covered include economics of pricing, strategy and tactics of PRM, pricing optimization, differentiated pricing, dynamic pricing, mark-down pricing, legal and ethical issues in models/methods used in making effective PRM decisions and managerial or organizational factors that hold the key to success in execution of PRM.
Prerequisite: BUSI630.
Restriction: Must be in a major in BMGT-Robert H. Smith School of Business; or permission of BMGT-Robert H. Smith School of Business.
Credit Only Granted for: BUDT758D or BUDT775.
Formerly: BUDT758D.

BUFN - Finance

BUFN400 Introduction to Financial Markets and Financial Datasets (3 Credits)
Provides an overview of financial concepts and markets and datasets. Company financial statements will be used to review concepts including earnings, cash flow, accruals, investment, dividends, etc. The course will introduce concepts related to portfolio theory and asset pricing. It will introduce the fundamentals of the stock market and market microstructure, including bid ask spreads and market liquidity. Advanced topics include event studies, high frequency trading, Over The Counter (OTC) bond markets, and more specialized institutional arrangements including repo markets and foreign currency exchange markets.
Prerequisite: STAT400, STAT401, STAT410, or STAT420.
Recommended: CMSC320, CMSC351, MATH240, and MATH241; and should have extensive familiarity with Python including Pandas, Numpy, Scipy, Matplotlib; and familiarity with probability and statistics, econometric modeling.
Restriction: Must be in the Computational Finance (#BU04) minor.

BUFN401 Option Theory and Derivatives (3 Credits)
Will introduce Option Theory and the concept of a derivative financial contract whose value is based on some underlying asset, e.g., a stock or bond or commodity. Option theory based pricing models are a cornerstone of modern finance. Unlike the Capital Asset Pricing Model (CAPM) that determines an appropriate rate of return, option theory primarily relies on arbitrage arguments, and the probability that an option will be exercised during some time interval. Option theory has been very successful empirically. Common derivative types include stock and bond and index options, futures contracts, forward contract and swaps.
Prerequisite: BUFN400.
Restriction: Must be in Computational Finance (#BU04) minor.

BUFN402 Portfolio Management (3 Credits)
The fundamentals of portfolio management, including asset allocation, investing strategies, and risk management. The class describes some of the main strategies used by hedge funds and provides methodologies to analyze them. The strategies are illustrated using real financial data, and students learn to apply tools for performance measurement, portfolio optimization (quadratic programming), factor models, predictive regression analysis, backtesting, and managing transaction costs.
Prerequisite: BUFN400.
Restriction: Must be in the Computational Finance (#BU04) minor.

BUFN403 Capstone Computational Finance Projects (3 Credits)
This is a semester-long capstone project to be completed by student groups. The projects will range from academic research projects (co-mentored by a finance or computer science faculty member) or an industry focused project (co-mentored by an industry coach). Each project must address an interesting real world challenge faced by a researcher, an analyst or a financial regulator. The project would ideally use a real dataset. Teams can create their own datasets or re-purpose existing datasets. There will be credit given to teams who create or curate their own datasets. The project should apply methodology based in machine learning, information / data management, including NLP and text analytics. The project must include a visual analytics component so that the results from the project can be presented and explained to the user.
Prerequisite: CMSC320; and (BUFN401 or BUFN402; or permission of the Computational Finance Minor faculty directors).
Restriction: Must be in the Computational Finance (#BU04) minor.

BUFN602 Introduction to Financial Accounting (2 Credits)
Overview of financial accounting, periodic financial statements and the financial reporting process. Importance of financial statements as information source for creditors and investors and as a means by which managers can communicate information about their firms.
Restriction: Permission of BMGT-Robert H. Smith School of Business; or must be in Business and Management (Master's) program.
Credit Only Granted for: BUSI610, BUAC602, BUFN602, or BMGT602.

BUFN610 Financial Management (2 Credits)
The fundamental concepts and techniques used to evaluate corporate decisions. Topics include the time value of money, valuation of common securities, investment decisions, capital budgeting, capital structure, and the weighted average cost of capital. The objectives are to develop the ability to make investment decisions, manage project finances, and analyze financial decisions.
Restriction: Permission of BMGT-Robert H. Smith School of Business; or must be in Business and Management (Master's) program.
Credit Only Granted for: BUSI640, BUFN610, or BMGT610.

BUFN620 Capital Markets (2 Credits)
Covers modern theories and techniques for analyzing investments in different securities. Introduces mathematical and statistical models to price securities and guide investment decisions. The main topics covered are portfolio theory, pricing models, market efficiency, fixed income investment, and options.
Restriction: Must be in one of the following programs (Business and Management (Master's); Business and Management (Master's)) ; or permission of BMGT-Robert H. Smith School of Business.
Credit Only Granted for: BUFN740 or BUFN620.
Formerly: BUFN740.

BUFN630 Valuation in Corporate Finance (2 Credits)
An advanced corporate finance course focusing on valuation. The main objective is to apply the concepts covered in the introductory finance class through real-life applications (cases) and use valuation estimates to guide and communicate investment decisions. The topics include building Pro Forma statements and forecasting future cash flows, dynamic cash flow models, estimating the cost of capital, implementing the Weighted Average Cost of Capital (WACC) and Adjusted Present Value (APV) methods, and using real options techniques (binomial and Black and Scholes models as well as Monte Carlo simulations) to value companies and projects.
Prerequisite: BUFN610.
Restriction: Must be in one of the following programs (Business and Management (Master's); Business and Management (Master's)) ; or permission of BMGT-Robert H. Smith School of Business.
Credit Only Granted for: BUFN630, BUFN714, BUFN750, BUFN753, or BMGT730.
Formerly: BUFN750.

BUFN640 Financial Data Analytics (2 Credits)
Introduces the skills and computing languages for analyzing financial data and testing financial models. Covers topics such as the ordinary least square regression (OLS) estimator, its properties and applications, statistical inference, and univariate and multivariate analysis. The focus is on working with data and applying econometric models to financial applications such as estimating asset pricing models, portfolio choice, and the efficient frontier. The course will use Python programming language, Google Colab environment, and matching learning packages.
Restriction: Must be in Business and Management (Master's) program; or permission of BMGT-Robert H. Smith School of Business.
Credit Only Granted for: BUFN758N of BUFN640.
Formerly: BUFN758N.

BUFN650 Machine Learning in Finance (2 Credits)
A hands-on course on applications of cutting-edge machine learning methods to financial modeling. It builds on the Financial Analytics class to introduce students to a wide variety of machine learning techniques ranging from lasso regression to deep learning and TensorFlow. The course provides the basic ideas and intuition behind these methods, a more formal understanding of how and why they work, and opportunities to experiment with machine-learning algorithms and apply them to big data modeling in finance. It will use the Python programming language, Google Colab environment, and machine learning packages.
Prerequisite: BUFN640.
Restriction: Must be in Business and Management (Master's) program; or permission of BMGT-Robert H. Smith School of Business.
Credit Only Granted for: BUFN758O or BUFN650.
Formerly: BUFN758O.

BUFN660 Derivative Securities (2 Credits)
Introduces standard derivative contracts, including forwards and futures, swaps, and options. Covers the mathematical foundation of valuing derivative contracts, the use of static and dynamic replication strategies, and the concept of no-arbitrage. Derivative securities on various underlying assets (equities, indices, commodities, foreign exchange, etc.) are analyzed using different application contexts.
Prerequisite: BUFN610.
Restriction: Must be in one of the following programs (Business and Management (Master's); Business and Management (Master's)) ; or permission of BMGT-Robert H. Smith School of Business.
Credit Only Granted for: BUFN660, BUFN726, BUFN761 or BUFN773.
Formerly: BUFN761.

BUFN670 Financial Mathematics (2 Credits)
Introduction to the mathematical models used in finance and economics with emphasis on pricing derivative instruments. Topics include elements from basic probability theory, distributions of stock returns, elementary stochastic calculus, Ito's Lemma, arbitrage pricing theory, and continuous time portfolio theory. Particular focus is on the financial applications of these mathematical concepts.
Restriction: Must be in Business and Management (Master's) program; or permission of BMGT-Robert H. Smith School of Business.

BUFN710 Financial Strategy for Corporations (2 Credits)
An advanced course in corporate finance, focusing on the issues that firms face when they plan to raise external capital from financial markets. The focus is on the financing problems faced by mid-market to large firms and on capital raised from public markets. The forms of external finance vary from simple debt or equity to more complex securities that bundle with an element of risk management.
Prerequisite: BUFN610; or permission of BMGT-Robert H. Smith School of Business.
Restriction: Permission of BMGT-Robert H. Smith School of Business; or must be in Business and Management (Master's) program.
Credit Only Granted for: BUFN751 or BUFN710.
Formerly: BUFN751.

BUFN712 Financial Restructuring (2 Credits)
Focuses on identifying ways to increase firm value through corporate restructuring. Specific topics include: mergers and tender offers, spin-offs, carve-outs, divestitures, takeover defense strategies, leveraged buy-outs, and international acquisitions. Additionally, the theory, practice and empirical evidence related to each of these topics will be covered. Emphasis will be placed on valuation analysis and strategic considerations.
Prerequisite: BUFN610.
Restriction: Permission of BMGT-Robert H. Smith School of Business; or must be in Business and Management (Master's) program.
Credit Only Granted for: BUFN712 or BUFN752.
Formerly: BUFN752.

BUFN714 Corporate Governance and Performance (2 Credits)
Deals with corporate governance and its impact on shareholder value. Divergence of interests between corporate insiders and providers of funds leads to agency problems which can impair corporate performance and shareholder value. Various instruments of corporate governance - internal as well as external mechanisms - that can help align managerial incentives with those of outside investors, and hence help restore shareholder value will be studied.
Prerequisite: BUFN610.
Restriction: Must be in Business and Management (Master's) program; or permission of BMGT-Robert H. Smith School of Business.
Credit Only Granted for: BUFN630, BUFN714, BUFN750, BUFN753, or BMGT730.
Formerly: BUFN753.

BUFN716 Corporate Risk Management (2 Credits)
Surveys the theory and practice of financial risk identification, measurement, and mitigation at financial and non-financial firms. Topics will include hedging with options and futures, interest rate risk management, Value-at-Risk (VaR), Cashflow-at-Risk (CaR), Earnings-at-Risk (EaR), credit risk, equity risk, commodities risk, exchange rate risk, and lessons from risk management disasters.
Prerequisite: BUFN610.
Restriction: Permission of BMGT-Robert H. Smith School of Business; or must be in Business and Management (Master's) program.
Credit Only Granted for: BUFN716 or BUFN754.
Formerly: BUFN754.

BUFN717 Entrepreneurial Finance and Private Equity (2 Credits)
An advanced topics course in Corporate Finance. The major emphasis is how financiers help growing firms - and in particular young start-ups - using different types of securities at different points in the industry's and firm's life. Financing arrangements and securities studied will include private equity funds and private financings placements, Venture Capital (VC) and preferred equity, Investment Banks through Initial Public Offerings (IPOs), Private equity finds, debt and leveraged buyouts. Students will learn additional techniques that will help them understand how financiers value firms and how to understand, plan and value different financing strategies.
Prerequisite: BUFN610.
Restriction: Permission of BMGT-Robert H. Smith School of Business; or must be in Business and Management (Master's) program.
Credit Only Granted for: BUFN755 or BUFN717.
Formerly: BUFN755.

BUFN721 International Investment (2 Credits)
Addresses international stock markets, portfolio theory, international interest rates, exchange rates and exchange rate derivatives (options, forwards, and futures), exchange rate swaps and exchange rate exposure (operating, translation, and transaction), foreign investment strategy.
Prerequisite: BUFN610.
Restriction: Must be in Business and Management (Master's) program; or permission of BMGT-Robert H. Smith School of Business.
Credit Only Granted for: BUFN721 or BUFN770.
Formerly: BUFN770.

BUFN722 Banking and Financial Institutions (3 Credits)
The role of financial management in banking and financial institutions. The economic role and regulation of banking and financial institutions, analysis of risks and returns on financial assets and liabilities, and the structure of assets, liabilities and capital.
Prerequisite: BUSI640.
Credit Only Granted for: BUFN722, BUFN724, or BUFN772.

BUFN723 International Corporate and Project Finance (2 Credits)
Continuation of BUFN721. Issues addressed will include captial budgeting, project financing, exhange rate exposure (operating, translation, and transaction), foreign investment strategy, and risk management.
Prerequisite: BUFN610 and BUFN721.
Restriction: Must be in Business and Management (Master's) program; or permission of BMGT-Robert H. Smith School of Business.
Credit Only Granted for: BUFN723 or BUFN771.
Formerly: BUFN771.

BUFN724 Bank Management (2 Credits)
Analyze and discuss readings in bank management,with primary focus on the measurement and management of risk, including credit, market, and interest rate risk. Look at the management of liquid reserves. Examine the special nature of financial institutions, incorporating their functions, policies, services, and regulation. Study the evolving nature of the financial services inductry, by reading the financial press and by having outside practitioner speakers. Focus is on U.S. banks.
Prerequisite: BUFN610.
Restriction: Must be in Business and Management (Master's) program; or permission of BMGT-Robert H. Smith School of Business.
Credit Only Granted for: BUFN724 or BUFN772.
Formerly: BUFN772.

BUFN726 Institutional Asset Management (2 Credits)
Examines how money is managed by organizations such as university endowments, pension funds, mutual funds, hedge funds, and private equity funds. Involves a mixture of finance and economics and emphasizes the incentives professional money managers face within the context of the organizational structure in which they operate. Particular attention is paid to compensation structures and monitoring mechanisms.
Prerequisite: BUFN610.
Restriction: Must be in Business and Management (Master's) program; or permission of BMGT-Robert H. Smith School of Business.
Credit Only Granted for: BUFN660, BUFN726, BUFN761 or BUFN773.
Formerly: BUFN773.

BUFN730 Advanced Financial Modeling and Equity Analysis (2 Credits)
Provides in-depth analysis of public equities, with a focus on financial statement analysis, financial forecasting and ultimately valuation. Students will apply the primary valuation techniques used in industry to estimate market values for equities. Additionally, students learn how to stress test their financial models and interpret outcomes.
Prerequisite: BUFN610.
Restriction: Permission of BMGT-Robert H. Smith School of Business; or must be in Business and Management (Master's) program.
Credit Only Granted for: BUFN760 or BUFN730.
Formerly: BUFN760.

BUFN732 Fixed Income Analysis (2 Credits)
Describes important financial instruments which have market values that are sensitive to interest rate movements. Develops tools to analyze interest rate sensitivity and value fixed income securities. Defines and explains the vocabulary of the bond management business.
Prerequisite: BUFN610.
Restriction: Permission of BMGT-Robert H. Smith School of Business; or must be in Business and Management (Master's) program.
Credit Only Granted for: BUFN732 or BUFN762.
Formerly: BUFN762.

BUFN734 Portfolio Management (2 Credits)
Provides training that is important in understanding the investment process - the buy side of the financial world. Specifically, the objective is to provide graduate-level instruction in the following topics, both in theory and in using financial markets data to test the basic theory and practice of portfolio choice and equilibrium pricing models and their implications for efficient portfolios.
Prerequisite: BUFN610.
Restriction: Permission of BMGT-Robert H. Smith School of Business; or must be in Business and Management (Master's) program.
Credit Only Granted for: BUFN734 or BUFN763.
Formerly: BUFN763.

BUFN736 Quantitative Investment Strategies (2 Credits)
Provides an introduction to quantitative techniques of selecting equities, as used commonly among long-short equity hedge funds and other quantitative equity asset management companies. Statistical factor models are developed to locate stocks with higher expected returns, based on the observable characteristics of the stocks. Implementation issues, including statistical estimation, backtesting and portfolio construction, are covered, as is performance evaluation.
Prerequisite: BUFN610.
Restriction: Must be in a major in BMGT-Robert H. Smith School of Business; or must be in Business and Management (Master's) program.
Credit Only Granted for: BUFN764 or BUFN736.
Formerly: BUFN764.

BUFN738 Investment Fund Management (3 Credits)
Provides second-year Master in Business Administration students with the opportunity to apply the skills learned in finance classes to actual investment decisions through management of an investment fund.
Prerequisite: BUSI640.
Restriction: Must be in one of the following programs (Business and Management (Master's); Business and Management (Master's)).
Repeatable to: 9 credits.

BUFN740 Capital Markets (2 Credits)
Designed to deepen the foundations necessary to finance focused students, especially those intending to specialize in the quantitative areas of finance including investments, fixed income, and financial engineering.
Prerequisite: BUSI640.
Restriction: Must be in one of the following programs (Business and Management (Master's); Business and Management (Master's)).
Credit Only Granted for: BUFN740 or BUFN620.

BUFN741 Advanced Capital Markets (2 Credits)
This course covers modern theories and techniques for investments and asset pricing. The main topics covered are: portfolio theory, pricing models, market efficiency, fixed income investment, forwards and futures, and options.
Prerequisite: BUFN620; or permission of BMGT-Robert H. Smith School of Business.
Restriction: Must be in Business and Management (Master's) program; or permission of BMGT-Robert H. Smith School of Business.
Credit Only Granted for: BUFN758P or BUFN741.
Formerly: BUFN758P.

BUFN742 Financial Engineering (2 Credits)
Introduces and applies various computational techniques useful in the management of equity and fixed income portfolios and the valuation of financial derivatives and fixed income securities. Techniques include Monte Carlo Simulation and binomial/lattice pricing models. Emphasis is on bridging theory with the design of algorithms and models that can be directly applied in practice.
Prerequisite: BUFN610.
Restriction: Permission of BMGT-Robert H.
Credit Only Granted for: BUFN742 or BUFN766.
Formerly: BUFN766.

BUFN744 Fixed Income Derivatives (2 Credits)
Surveys fixed income assets and related securities such as Exchange-traded bond options; bonds with embedded options; floating rate notes; caps, collars, and floors; floating rate notes with embedded options. Also surveys advanced tools for interest-rate and fixed-income portfolio management, including the use of derivative securities, and the application of binomial trees for analysis of options, and a sound understanding of stochastic yield curves.
Prerequisite: BUFN610; and BUFN732.
Restriction: Must be in Business and Management (Master's) program; or permission of BMGT-Robert H. Smith School of Business.
Credit Only Granted for: BUFN765 or BUFN744.
Formerly: BUFN765.

BUFN745 Financial Programming (2 Credits)
This course introduces basic and innovative statistical modelling methods for financial markets, and equips students with analytical and programming tools for modelling and analyzing financial data. Examples of applications include portfolio management and risk management.
Prerequisite: BUFN650.
Restriction: Must be in Business and Management (Master's) program; or permission of BMGT-Robert H. Smith School of Business.
Credit Only Granted for: BUFN758E or BUFN745.
Formerly: BUFN758E.

BUFN746 Enterprise and Credit Risk Management (2 Credits)
Surveys the theory and practice of credit risk identification, measurement and mitigation along with understanding the principles of enterprise risk governance and risk-adjusted returns. The course examines how to develop credit loss distributions via Monte Carlo simulation or copula methodologies for consumer assets such as mortgages, credit cards and auto loans, developing commercial loan scorecards for rating credit risk. Pricing and use of various credit structures such as credit default swaps, collateralized debt obligations and credit-linked notes is examined.
Prerequisite: BUSI640; and BUFN740.
Restriction: Must be in Business and Management (Master's) program; or permission of BMGT-Robert H. Smith School of Business.

BUFN747 Asset-Liability and Nonfinancial Risk Management (2 Credits)
This course surveys risks and techniques associated with asset-liability and nonfinancial risks including market and interest rate risk, liquidity risk, operational risk and model risk, among others. Techniques such as portfolio value-at-risk (VaR) are used in realistic empirical examples to illustrate the methods. Key rate duration, principal components analysis and analytical and simulation-based VaR techniques are used to estimate interest rate risk exposure for financial firms. Hedging these risks using various financial derivative products such as options, swaps and futures contracts is explored. Operational risk is estimated leveraging Poisson loss distributions and model risk and validation techniques are reviewed.
Prerequisite: BUSI640; and BUFN740.
Restriction: Must be in Business and Management (Master's) program; or permission of BMGT-Robert H. Smith School of Business.

BUFN750 Valuation in Corporate Finance (2 Credits)
An advanced topics course in Corporate Finance dealing with valuation. Main topics will be, building pro forma statements, cost of capital, using ratios and comparables to value projects and firms, dicounted cash flow valuations, WACC and APV methods of valuation and Real Option Valuations.
Prerequisite: BUSI640.
Restriction: Must be in one of the following programs (Business and Management (Master's); Business and Management (Master's)).
Credit Only Granted for: BUFN630, BUFN714, BUFN750, BUFN753, or BMGT730.
Formerly: BUFN714.

BUFN751 Financial Strategy For Corporations (2 Credits)
An advanced course in corporate finance, focusing on the issues that firms face when they plan to raise external capital from financial markets. The focus is on the financing problems faced by mid-market to large firms and on capital raised from public markets. The forms of external finance vary from simple debt or equity to more complex securities that bundle with an element of risk management.
Prerequisite: BUSI640.
Restriction: Must be in one of the following programs (Business and Management (Master's); Business and Management (Master's)).
Credit Only Granted for: BUFN751 or BUFN710.

BUFN752 Financial Restructuring (2 Credits)
Focuses on identifying ways to increase firm value through corporate restructuring. Specific topics include: mergers and tender offers, spin-offs, carve-outs, divestitures, takeover defense strategies, leveraged buy-outs, and international acquisitions. Additionally, the theory, practice and empirical evidence related to each of these topics will be covered. Emphasis will be placed on valuation analysis and strategic considerations.
Prerequisite: BUSI640.
Restriction: Must be in one of the following programs (Business and Management (Master's); Business and Management (Master's)).
Credit Only Granted for: BUFN712 or BUFN752.
Formerly: BUFN712.

BUFN753 Corporate Governance and Performance (2 Credits)
Deals with corporate governance and its impact on shareholder value. Divergence of interests between corporate insiders and providers of funds leads to agency problems which can impair corporate performance and shareholder value. Various instruments of corporate governance - internal as well as external mechanisms - that can help align managerial incentives with those of outside investors, and hence help restore shareholder value will be studied.
Prerequisite: BUSI640.
Restriction: Must be in one of the following programs (Business and Management (Master's); Business and Management (Master's)).
Credit Only Granted for: BUFN630, BUFN714, BUFN750, BUFN753, or BMGT730.

BUFN754 Corporate Risk Management (2 Credits)
Surveys the theory and practice of financial risk identification, measurement, and mitigation at financial and non-financial firms. Topics will include hedging with options and futures, interest rate risk management, Value-at-Risk (VaR), Cashflow-at-Risk (CaR), Earnings-at-Risk (EaR), credit risk, equity risk, commodities risk, exchange rate risk, and lessons from risk management disasters.
Prerequisite: BUSI640.
Restriction: Must be in one of the following programs (Business and Management (Master's); Business and Management (Master's)).
Credit Only Granted for: BUFN716 or BUFN754.

BUFN755 Entrepreneurial Finance and Private Equity (2 Credits)
An advanced topics course in Corporate Finance. The major emphasis is how financiers help growing firms - and in particular young start-ups - using different types of securities at different points in the industry's and firm's life. Financing arrangements and securities studied will include private equity funds and private financings placements, Venture Capital (VC) and preferred equity, Investment Banks through Initial Public Offerings (IPOs), Private equity finds, debt and leveraged buyouts. Students will learn additional techniques that will help them understand how financiers value firms and how to understand, plan and value different financing strategies.
Prerequisite: BUSI640.
Restriction: Must be in one of the following programs (Business and Management (Master's); Business and Management (Master's)).
Credit Only Granted for: BUFN755 or BUFN717.

BUFN758 Special Topics in Finance (1-4 Credits)
Selected advanced topics in the various fields of graduate study in finance.
Prerequisite: Permission of BMGT-Robert H. Smith School of Business.
Repeatable to: 9 credits if content differs.
Formerly: BMGT798.

BUFN759 Independent Study in Finance (1-6 Credits)
Independent study for Masters students in finance.
Repeatable to: 6 credits if content differs.
Formerly: BMGT708.

BUFN760 Applied Equity Analysis (2 Credits)
Students will learn to analyze equity securities using the basic EIC (Economy/Industry/Company) framework used in the financial industry, paying special attention to financial statement analysis. Students also will learn the primary valuation techniques used to estimate market values for equity securities.
Prerequisite: BUSI640.
Restriction: Must be in one of the following programs (Business and Management (Master's); Business and Management (Master's)).
Credit Only Granted for: BUFN730 or BUFN760.

BUFN761 Derivative Securities (2 Credits)
Standard types of derivatives contracts are presented, and illustrated as to how they are used in practice. The theory of pricing these contracts is then presented in detail. The use of static and dynamic replication strategies, and the concept of no-arbitrage strategies is illustrated in numerous ways. Standard valuation techniques are covered, and standard formulas are presented. The theory is then applied to develop specific pricing and hedging strategies for various types of derivatives on different underlying assets. The management of the exposure of various risks is covered in detail as well.
Prerequisite: BUFN740.
Restriction: Must be in one of the following programs (Business and Management (Master's); Business and Management (Master's)).
Credit Only Granted for: BUFN660, BUFN726, BUFN761 or BUFN773.
Formerly: BUFN726.

BUFN762 Fixed Income Analysis (2 Credits)
Describes important financial instruments which have market values that are sensitive to interest rate movements. Develops tools to analyze interest rate sensitivity and value fixed income securities. Defines and explains the vocabulary of the bond management business.
Prerequisite: BUFN740.
Restriction: Must be in one of the following programs (Business and Management (Master's); Business and Management (Master's)).
Credit Only Granted for: BUFN732 or BUFN762.

BUFN763 Portfolio Management (2 Credits)
Provides training that is important in understanding the investment process - the buy side of the financial world. Specifically, the objective is to provide graduate-level instruction in the following topics, both in theory and in using financial markets data to test the basic theory and practice of portfolio choice and equilibrium pricing models and their implications for efficient portfolios.
Prerequisite: BUFN740.
Restriction: Must be in one of the following programs (Business and Management (Master's); Business and Management (Master's)).
Credit Only Granted for: BUFN734 or BUFN763.

BUFN764 Quantitative Investment Strategy (2 Credits)
Provides an introduction to quantitative techniques of selecting equities, as used commonly among long-short equity hedge funds and other quantitative equity asset management companies. Statistical factor models are developed to locate stocks with higher expected returns, based on the observable characteristics of the stocks. Implementation issues, including statistical estimation, backtesting and portfolio construction, are covered, as is performance evaluation.
Prerequisite: BUFN763.
Restriction: Must be in a major in BMGT-Robert H. Smith School of Business.
Credit Only Granted for: BUFN764 or BUFN736.

BUFN765 Fixed Income Derivatives (2 Credits)
Surveys fixed income assets and related securities such as Exchange-traded bond options; bonds with embedded options; floating rate notes; caps, collars, and floors; floating rate notes with embedded options. Also surveys advanced tools for interest-rate and fixed-income portfolio management, including the use of derivative securities, and the application of binomial trees for analysis of options, and a sound understanding of stochastic yield curves.
Prerequisite: BUFN762.
Restriction: Must be in one of the following programs (Business and Management (Master's); Business and Management (Master's)).
Credit Only Granted for: BUFN765 or BUFN744.

BUFN766 Financial Engineering (2 Credits)
Develop Excel and Visual Basic (VBA) models to solve problems related to portfolio management, options valuation, fixed income securities, interest rate processes, and risk management. This course thus bridges theory with the design of algorithms and models that can be directly applied in practice.
Prerequisite: BUFN740.
Restriction: Must be in one of the following programs (Business and Management (Master's); Business and Management (Master's)).
Credit Only Granted for: BUFN742 or BUFN766.

BUFN768 Special Topics in Finance (1-4 Credits)
Selected experiential learning opportunities in advanced topics in the various fields of graduate study in finance.
Prerequisite: Permission of BMGT-Robert H. Smith School of Business.
Restriction: Must be in Business and Management (Master's) program; or permission of BMGT-Robert H. Smith School of Business.
Repeatable to: 9 credits if content differs.

BUFN770 International Investment (2 Credits)
Addresses international stock markets, portfolio theory, international interest rates, exchange rates and exchange rate derivatives (options, forwards, and futures), exchange rate swaps and exchange rate exposure (operating, translation, and transaction), foreign investment strategey.
Prerequisite: BUSI640.
Restriction: Must be in one of the following programs (Business and Management (Master's); Business and Management (Master's)).
Credit Only Granted for: BUFN721 or BUFN770.

BUFN771 International Corporate and Project Finance (2 Credits)
Continuation of BUFN770. Issues addressed will include captial budgeting, project financing, exhange rate exposure (operating, translation, and transaction), foreign investment strategy, and risk management.
Prerequisite: BUFN770.
Restriction: Must be in one of the following programs (Business and Management (Master's); Business and Management (Master's)).
Credit Only Granted for: BUFN724 or (BUFN770 and BUFN771).
Formerly: BUFN724.

BUFN772 Bank Management (2 Credits)
Analyze and discuss readings in bank management,with primary focus on the measurement and management of risk, including credit, market, and interest rate risk. Look at the management of liquid reserves. Examine the special nature of financial institutions, incorporating their functions, policies, services, and regulation. Study the evolving nature of the financial services inductry, by reading the financial press and by having outside practitioner speakers. Focus is on U.S. banks.
Prerequisite: BUSI640.
Restriction: Must be in one of the following programs (Business and Management (Master's); Business and Management (Master's)).
Credit Only Granted for: BUFN722, BUFN724, or BUFN772.
Formerly: BUFN722.

BUFN773 Institutional Asset Management (2 Credits)
Examines how money is managed by organizations such as university endowments, pension funds, mutual funds, hedge funds, and private equity funds. Involves a mixture of finance and economics and emphasizes the incentives professional money managers face within the context of the organizational structure in which they operate. Particular attention is paid to compensation structures and monitoring mechanisms.
Prerequisite: BUSI640.
Restriction: Must be in one of the following programs (Business and Management (Master's); Business and Management (Master's)).
Credit Only Granted for: BUFN660, BUFN726, BUFN761 or BUFN773.

BULM - Logistics, Business, and Public Policy

BULM700 Business Fundamentals for Supply Chain Managers I (2 Credits)
This course is part of a series of two courses Business Fundamentals for SCM part I and, part II. The series is intended to provide you with the knowledge and skills necessary to quantify the impact of supply chain management decisions on the bottom line. Students will gain a solid understanding of accounting, finance and the link between supply chain and overall financial performance. Students will analyze financial statements and explain the implications of supply chain management decisions on standard financial ratios and all components of the balance sheet and income statement. Through interactive supply chain finance models, students will demonstrate the sensitivity of outcome to multiple independent variables. Last but not least, students will also learn how to apply the net present value technique to evaluate the feasibility of investment projects in supply chain.
Restriction: Permission of BMGT-Robert H. Smith School of Business; or must be in Business and Management (Master's) program.
Credit Only Granted for: BULM758K or BULM700.
Formerly: BULM758K.

BULM701 Business Fundamentals for Supply Chain Managers II (2 Credits)
This is the second course of the series Business fundamentals for Supply Chain Managers. This course is intended to provide you with the knowledge and skills necessary to quantify the impact of supply chain management decisions on the bottom line. Students will gain a solid understanding of accounting, finance and the link between supply chain and overall financial performance. Students will analyze financial statements and explain the implications of supply chain management decisions on standard financial ratios and all components of the balance sheet and income statement. Through interactive supply chain finance models, students will demonstrate the sensitivity of outcome to multiple independent variables. Last but not least, students will also learn how to apply the net present value technique to evaluate the feasibility of investment projects in supply chain.
Prerequisite: BULM700; or permission of BMGT-Robert H. Smith School of Business.
Restriction: Must be in Business and Management (Master's) program; or permission of BMGT-Robert H. Smith School of Business.
Credit Only Granted for: BULM758Q or BULM701.
Formerly: BULM758Q.

BULM710 Data Driven Decision Making I (2 Credits)
Analytical modeling of business decisions; uncertainty, risk and expected utility; regression modeling to infer relationships among variables.
Restriction: Must be in Business and Management (Master's) program; or permission of BMGT-Robert H. Smith School of Business.
Credit Only Granted for: BUSI630, BULM758X or BULM710.
Formerly: BULM758X.

BULM711 Data Driven Decision Making II (2 Credits)
Analytical modeling of business decisions; uncertainty, risk and expected utility; regression modeling to infer relationships among variables.
Restriction: Must be in Business and Management (Master's) program; or permission of BMGT-Robert H. Smith School of Business.
Credit Only Granted for: BUSI630, BULM758Y or BULM711.
Formerly: BULM758Y.

BULM720 The Green Supply Chain (2 Credits)
In response to international regulation of carbon emissions and increasing corporate responsibility pressures, companies are seeking to develop greener supply chains. Companies such as WalMart have undergone a paradigm shift in how they manage their businesses to emphasize environmental stewardship and due diligence on product sustainability. Students are provided with key concepts and tools for designing and managing environmentally sustainable, low-impact supply chains.
Restriction: Must be in one of the following programs (Business and Management (Master's); Business and Management (Master's)).

BULM721 Global Supply Chain Management (2 Credits)
Offers a practical blueprint for understanding, building, implementing, and sustaining supply chains in today's rapidly changing global supply chain environment. It will provide the student with a survey of the fast-moving Supply Chain Management discipline and practice, including the evolution of supply chain strategies, business models and technologies; current best practices in demand and supply management; and methodologies for conducting supply chain-wide diagnostic assessments and formulating process improvement plans.
Restriction: Must be in Business and Management (Master's) program; or permission of BMGT-Robert H. Smith School of Business.
Credit Only Granted for: BUSI672 or BULM721.

BULM724 Negotiations in Supply Chain Management (2 Credits)
This high experiential course will improve students' negotiation skills and capacity to acquire and effectively use power. By using a variety of assessment tools, feedback sources, skill-building exercises, and exercise debriefings, the class will increase students' negotiating self-confidence and improve their capacity to achieve win-win solutions to individual, team, and organizational problems. The course is designed to enhance students negotiating self confidence and improve students analytical skills, interpersonal skills, creativity (e.g., identifying creative solutions to conflict), and persuasive abilities.
Restriction: Must be in one of the following programs (Business and Management (Master's); Business and Management (Master's)).

BULM726 Purchasing Management (2 Credits)
Examines purchasing methods from both a tactical and straegic viewpoint. Special emphasis is placed on developing purchasing strategies from international suppliers and the trade-offs between outsourcing and insourcing.
Restriction: Must be in one of the following programs (Business and Management (Master's); Business and Management (Master's)).

BULM731 Technology Applications in Supply Chain Management (2 Credits)
In this course, we introduce the knowledge and skills necessary to quantify the impact of supply chain management decisions on the bottom line. Students will gain an understanding of accounting, finance, production cost, scheduling, and the link between supply chain and overall financial performance.
Restriction: Must be in Business and Management (Master's) program; or permission of BMGT-Robert H. Smith School of Business.

BULM732 Networks and Influence (2 Credits)
Focuses on networks, social capital, and influence as they relate to operating effectively in organizations. It draws heavily on emerging literature related to social capital and networks, but also integrates concepts from persuasion, communication, and motivation literatures to aid your efforts to build a successful track record for yourself and your organization.
Restriction: Must be in Business and Management (Master's) program; or permission of BMGT-Robert H. Smith School of Business.
Credit Only Granted for: BUMO725 or BULM732.

BULM733 Global Trade Logistics (2 Credits)
Acquaints students with managerial issues in international logistics and transportation, and provides students with an understanding of issues related to import/export management and the global marketplace.
Restriction: Must be in one of the following programs (Business and Management (Master's); Business and Management (Master's)) ; or permission of BMGT-Robert H. Smith School of Business.
Credit Only Granted for: BMGT773 or BULM733.
Formerly: BMGT773.

BULM734 Assessing and Managing Supply Chain Risks (3 Credits)
Supply chain managers are facing an increasingly volatile operating environment, with constant danger of trading community disruption from business, social and environmental risks. Students are provided with a working knowledge of both the core techniques of supply chain risk assessment and mitigation; as well as best practices in establishing formal corporate supply chain risk management programs. A semester-long X-Treme Supply Chain Simulation will enable students to gain hands-on experience in navigating a computer company through a complex and risky four quarters of global business operations.
Restriction: Must be in one of the following programs (Business and Management (Master's); Business and Management (Master's)).

BULM735 Project Management in Dynamic Environments (2 Credits)
Addresses project management skills that are required by successful managers in increasingly competitive and faster-moving environments. Examines fundamental concepts of successful project management, and the technical and managerial issues, methods, and techniques.
Restriction: Must be in Business and Management (Master's) program; or permission of BMGT-Robert H. Smith School of Business.

BULM736 Executives in Supply Chain Management (3 Credits)
Designed to provide students an opportunity to engage in intensive interaction with senior supply chain executives from a cross-section of industries. Executives share their insights on leading competitive supply chains in the global marketplace, while students research the competitive supply chain dynamics of each executive's industry.
Restriction: Must be in one of the following programs (Business and Management (Master's); Business and Management (Master's)).

BULM742 Global Supply Chain Resources Planning (2 Credits)
Provides students with an overall understanding of how firms use an advanced supply chain planning (ASCP) application as an integral part of their materials management process which includes such activities as production planning, materials requirements planning, and distribution requirements planning.
Restriction: Must be in one of the following programs (Business and Management (Master's); Business and Management (Master's)) ; or permission of BMGT-Robert H. Smith School of Business.

BULM744 Global Supply Chain Risk Management (2 Credits)
Explores methods to build enterprise resillience from the perspectives of the supply chain planner and supply chain manager. Addresses concerns assessing strategic & operational risks, day to day uncertainties in demand & supply and ensuring business continuity after low probability but high impact events such as a terrorist attack or earthquake.
Restriction: Must be in one of the following programs (Business and Management (Master's); Business and Management (Master's)) ; and permission of BMGT-Robert H. Smith School of Business.

BULM750 Lean Sigma for Supply Chain I (2 Credits)
This course is part of a series of courses. This the second part of the Lean Six Sigma for SC Managers course series. We will be focusing on the Analyze, Improve and Control phases of the Lean Six Sigma methodology. Lean Six Sigma is a robust methodology for problem solving aiming to improve quality and reduce speed within a process. This course covers up to the Lean and Six Sigma Green Belt level body of knowledge. You will be expected to conduct a project on a case study of a business looking to improve their processes to meet customer requirements.
Restriction: Must be in Business and Management (Master's) program; or permission of BMGT-Robert H. Smith School of Business.
Credit Only Granted for: BULM758L or BULM750.
Formerly: BULM758L.

BULM751 Lean Sigma for the Supply Chain II (2 Credits)
This course is part of a series of courses. The first part will cover the Introduction, Define and Measure Phases of the Lean Six Sigma Methodology. Lean Six Sigma is a robust methodology for problem solving aiming to improve quality and reduce speed within a process. This course covers up to the Lean and Six Sigma Green Belt level body of knowledge. You will be expected to conduct a project on a case study of a business looking to improve their processes to meet customer requirements.
Prerequisite: BULM750.
Restriction: Must be in Business and Management (Master's) program; or permission of BMGT-Robert H. Smith School of Business.
Credit Only Granted for: BULM758V or BULM751.
Formerly: BULM758V.

BULM754 Global Transportation Management (2 Credits)
Introduces transportation as a field of managerial and governmental responsibility and presents the features that make the transportation arena unique and, thus,worthy of advanced study. Each of the five modes of transportation, along with other forms of carriage, will be considered. In addition, the importance of freight transportation within supply chain management will be examined. Issues related to passenger transportation will also be addressed. Throughout the course, particular attention will be paid to the significant impact that transportation has on economic development and growth.
Restriction: Must be in Business and Management (Master's) program; or permission of BMGT-Robert H. Smith School of Business.
Credit Only Granted for: BULM758T or BULM754.
Formerly: BULM758T.

BULM756 Supply Chain Strategy (2 Credits)
Examines supply chain management at the strategic level. Through class lectures, case discussions, and assignments, students first learn about the determinants of corporate strategy. Supply chain strategies are then discussed, along with the need to properly align supply chain strategy with corporate strategy. Finally, there is a discussion of how to implement supply chain strategy, given various environmental and market considerations.
Restriction: Must be in Business and Management (Master's) program; or permission of BMGT-Robert H. Smith School of Business.
Credit Only Granted for: BULM758B or BULM756.
Formerly: BULM758B.

BULM758 Special Topics in Logistics, Business and Public Policy (1-4 Credits)
Selected advanced topics in the various fields of graduate study in logistics, business and public policy.
Prerequisite: Permission of BMGT-Robert H. Smith School of Business.
Repeatable to: 9 credits if content differs.
Formerly: BMGT798.

BULM759 Independent Study in Logistics Management (1-6 Credits)
Independent study for Masters students in Logistics Management.
Repeatable to: 6 credits if content differs.
Formerly: BMGT708.

BULM761 Assessing & Managing Supply Chain Risks (2 Credits)
This course will expose students to the portfolio of best practice management concepts in Supply Chain Management. It provides students with a series of interactive experiences designed to teach the principles and operations of Supply Chain Risk Management (SCRM) in the global enterprise; and to equip students with the knowledge, tools, and techniques necessary to address the challenges of supply chain risk. Enhance the understanding of the principles of operational supply chain risk management.
Restriction: Must be in a Business and Management (Master's) program; or permission of BMGT-Robert H Smith School of Business.

BULM763 Buyer-Supplier Relations & Contract Negotiations (2 Credits)
This highly experiential course will improve students' contract negotiation skills and capacity to acquire and effectively use power in buyer-supplier relations.
Restriction: Must be in a Business and Management (Master's) program; or permission of BMGT-Robert H Smith School of Business.

BULM770 Strategic Management with a Sustainable Mindset (2 Credits)
In today's global marketplace, firms face mounting pressure from various stakeholders- activists, investors, and consumers- to mitigate the environmental impact of their operations and supply chains while upholding fundamental human rights and labor standards. At the same, using a sustainability lens while making strategic business decisions offers new opportunities for innovation and efficiency gains.
Restriction: Must be in a Business and Management (Master's) program; or permission of BMGT-Robert H Smith School of Business.

BULM772 Policy and Legal Context for Sustainability Management (2 Credits)
Examines the role of law in shaping individual and social norms of behavior. By its nature, the legal system creates a multi-layered complex array of incentives and penalties that serve to regulate expected responses within a society. Once established, the zone of individual freedom to operate is constrained by compulsory process within the applicable community standards of behavior. When applied on an international scale, the law must also reflect the consensus and of all parties, since enforcement depends upon internal self-controls.
Restriction: Must be admitted to the appropriate graduate business program; or permission of the Masters Programs Office at the Robert H. Smith School of Business.

BUMK - Marketing

BUMK701 Marketing Research Methods (2 Credits)
The process of acquiring, classifying and interpreting primary and secondary marketing data needed for intelligent, profitable marketing decisions. Evaluation of the appropriateness of alternative methodologies, such as the inductive, deductive, survey, observational, and experimental. Recent developments in the systematic recording and use of internal and external data needed for marketing decisions.
Prerequisite: BUSI650 and BUSI630.
Credit Only Granted for: BMGT752 or BUMK701.
Formerly: BMGT752.

BUMK706 Marketing Analysis (2 Credits)
Introduction to modeling tools used to support marketing analysis and decision making. Applications in strategic marketing, marketing segmentation, new product development, sales promotion analysis, pricing, design of marketing mix, sales force allocation, and direct marketing. Spreadsheet driven cases and illustrative readings.
Prerequisite: BUSI650.

BUMK715 Consumer Behavior (2 Credits)
Analysis of customer decision-making and how marketing strategy can be used to influence those decisions. The framework is a buyer behavior model, in which concepts from psychology, sociology, and economics are applied to individual and organizational purchase decisions. Marketing strategies of leading firms in consumer products, technology, and services (including internet services) are analyzed using a variety of case study formats. Focus is consumer behavior; however, principles can also be applied to the decision-making of business.
Prerequisite: BUSI650.
Restriction: Must be in one of the following programs (Business and Management (Master's); Business and Management (Master's)).
Credit Only Granted for: BMGT754 or BUMK715.
Formerly: BMGT754.

BUMK716 Brand Management (2 Credits)
Brand names are valuable assets for firms. Effective brand management is critical to maintaining the long-term profitability of products and services. Topics include understanding brands from the customer's perspective, building brand equity, measuring brand equity, leveraging brand equity, managing brand portfolios and managing brands over time.
Prerequisite: BUSI650.
Restriction: Must be in one of the following programs (Business and Management (Master's); Business and Management (Master's)) ; or permission of BMGT-Robert H. Smith School of Business.

BUMK717 Integrated Marketing Communications (2 Credits)
Marketing communications are a complex but critical component of marketing strategy. Topics include communication tools: advertising, sales promotions, corporation communications, one-on-one or direct marketing, public relations, internet communications, sponsorship/events marketing, and marketing communcation plans: defining objectives, implementing the plan, and measuring communications effectiveness. Achieving integration in the content, look, and feel of all marketing communications is stressed.
Prerequisite: BUSI650.
Restriction: Must be in one of the following programs (Business and Management (Master's); Business and Management (Master's)) ; or permission of BMGT-Robert H. Smith School of Business.

BUMK720 Marketing Strategy (3 Credits)
Introduces students to the fundamentals of marketing. This course combines lectures, readings, case analyses and a competitive simulation. A significant part of the course involves a competitive computer-based simulation in which student teams leverage marketing data and metrics to make marketing decisions for an organization that is competing in a market against other student teams in the class.
Restriction: Permission of BMGT-Robert H. Smith School of Business; or must be in Business and Management (Master's) program.
Credit Only Granted for: BUMK758B or BUMK720.
Formerly: BUMK758B.

BUMK722 Customer Equity Management (2 Credits)
Focuses on managing customers of a business, whether in B2B or B2C space, as a portfolio of equity; understanding the current and future value of customers to the business; selective acquisition, development, and retention of customers using latest developments in information technology.
Prerequisite: BUSI650.
Restriction: Must be in one of the following programs (Business and Management (Master's); Business and Management (Master's)).
Credit Only Granted for: BUMK722 or BUMK750.

BUMK724 Customer Analysis (3 Credits)
Focuses on the analysis of customer decision-making and how marketing strategy can be used to influence those decisions. The framework used is the buyer behavior model, in which concepts from psychology, sociology, and economics are applied to individual and organizational purchase decisions. Marketing strategies of leading firms in consumer products, technology, and services (including internet services) are analyzed using a variety of case study formats.
Restriction: Must be in Business and Management (Master's) program; or permission of BMGT-Robert H. Smith School of Business.
Credit Only Granted for: BUMK758D or BUMK724.
Formerly: BUMK758D.

BUMK726 Statistical Programming for Customer Analytics (3 Credits)
Provides students with a foundation in probability and statistics with a focus on business applications. It also gives students a foundation for thinking in both likelihood and Bayesian frameworks. The course teaches students the basics of SAS, as well as its use in statistical analysis and statistical programming. Also addressed are basic SAS language structure, data management, OLAP, enterprise miner, statistical analysis, writing procedures.
Restriction: Must be in Business and Management (Master's) program; or permission of BMGT-Robert H. Smith School of Business.
Credit Only Granted for: BUMK758E or BUMK726.
Formerly: BUMK758E.

BUMK731 Business-to-Business Marketing (2 Credits)
Focus is large fraction of marketing activity directed at organizational customers (businesses, non-profits and government). Marketing strategies, tactics and analytical tools most relevant when marketing to organizational customers are covered. Readings, cases and term paper contribute to understanding how to build long term buyer/seller relationships. Course is appropriate for anyone interested in understanding relationships between organizations, including vertical strategic alliances.
Prerequisite: BUSI650.

BUMK736 Service Marketing and Management (2 Credits)
Examines special challenges service marketing poses for managers because of the intangible, heterogeneous nature of the product, and the critical role of customer contact employees in service delivery. Strategies for meeting these challanges are addressed. Topics include 1) customer relationship management, 2) the design and execution of the service delivery process, 3) the development and implementation of employee customer service skills, 4) the measurement and management of critical outcome variables, such as customer satisfaction, customer equity, and customer lifetime value, and 5) the role of emerging technology in customer service.

BUMK742 Marketing Analytics for Consulting (3 Credits)
The analysis of marketing data needed for profitable marketing decisions. Advanced methods of marketing analysis for marketing decisions, including choice and count data models, joint analysis of consumers choice, quantity and timing decisions, mixture and mixture regression models, and conjoint analysis, all using data-based cases and SAS software. Applications are in the areas of strategic marketing, marketing segmentation, eye tracking for advertising effectiveness, new product development, sales promotion analysis, pricing, design of marketing mix, and direct marketing.
Restriction: Must be in Business and Management (Master's) program; or permission of BMGT-Robert H. Smith School of Business.
Credit Only Granted for: BUMK758K or BUMK742.
Formerly: BUMK758K.

BUMK744 Marketing Research and Analytics (3 Credits)
Provides a review of primary data collection methods for marketing data. Students will learn how to design and implement effective confirmatory research. Both direct methods such as surveys and indirect methods such as experiments will be covered. In this hands-on course, students will design and conduct research with target customers, analyze the data, and then present their results to decision makers.
Restriction: Must be in Business and Management (Master's) program; or permission of BMGT-Robert H. Smith School of Business.
Credit Only Granted for: BUMK758L or BUMK744.
Formerly: BUMK758L.

BUMK746 Data Science for Customer Analytics (3 Credits)
An introduction to data science and thebasic concepts of database management. The course also provides an overview of the various sources of in house data that are available to many organizations. Students will learn how to work with click stream, scanner panel and social media data. Geo-demographic datasets will be discussed and explored, and techniques for data-fusion will receive ample attention.
Restriction: Must be in Business and Management (Master's) program; or permission of BMGT-Robert H. Smith School of Business.
Credit Only Granted for: BUMK758W or BUMK746.
Formerly: BUMK758W.

BUMK747 CRM Analytics (2 Credits)
Customer Equity Management and Customer Relationship Marketing focuses on selective acquisition, development and retention of customers aided by developments in information technology and analytics - databases, online channels, social media, mobile technologies, and marketing analytics - with the objective of increasing a firm's customer equity (firm's value). This course will focus on the conceptual foundations of customer equity and relationship management, their strategic implications, and implementations in both B-2-B and B-2-C contexts, especially in the emerging era of big data. The course will provide insights into the role of measuring and managing customer equity and customer loyalty using online and offline media and channels. The objective of the course is to examine the strategic and analytical aspects in equal measure so that participants will have a deeper understanding of the power of customer equity and customer analytics, and how to put it to work effectively using data, big or small.
Restriction: Must be in Business and Management (Master's) program; or permission of BMGT-Robert H Smith.
Credit Only Granted for: BUMK758R or BUMK747.
Formerly: BUMK758R.

BUMK750 Customer Equity Management (2 Credits)
Managing customers of a business, whether in B2B or B2C space, as a portfolio of equity. Understanding the current and future value of customers to the business. Topics include selective acquisition, development, and retention of customers using latest developments in information technology.
Restriction: Must be in Business and Management (Master's) program; or permission of BMGT-Robert H. Smith School of Business.
Credit Only Granted for: BUMK722 or BUMK750.

BUMK757 Marketing Strategy (2 Credits)
A capstone marketing course. Marketing strategies designed to manage products in selected market segments. Topics covered include competitor analysis, buyer analysis, market segments, and product strengths and weaknesses; product related issues are identified and marketing strategies developed, assessed and implemented.
Prerequisite: BUSI650.
Credit Only Granted for: BMGT757 or BUMK757.
Formerly: BMGT757.

BUMK758 Special Topics in Marketing (1-4 Credits)
Selected advanced topics in the various fields of graduate study in marketing.
Restriction: Permission of BMGT-Robert H. Smith School of Business.
Repeatable to: 9 credits.
Formerly: BMGT798.

BUMK759 Independent Study in Marketing (1-6 Credits)
Independent study for Masters students in Marketing.
Repeatable to: 6 credits if content differs.
Formerly: BMGT708.

BUMK760 Business Policies and Ethics (2 Credits)
The standards of business conduct, morals and values as well as the role of business in society. Students will consider the sometimes conflicting interests of and claims on the firm and its objectives.
Restriction: Must be in Business and Management (Master's) program; or permission of BMGT-Robert H. Smith School of Business.
Credit Only Granted for: BUMK758F or BUMK760.
Formerly: BUMK758F.

BUMK762 Business Communication I (1 Credit)
A study of the standards of business conduct, morals and values as well as the role of business in society. Students will consider the sometimes conflicting interests of and claims on the firm and its objectives.
Restriction: Must be in Business and Management (Master's) program; or permission of BMGT-Robert H. Smith School of Business.
Credit Only Granted for: BUMK758H or BUMK762.
Formerly: BUMK758H.

BUMK764 Business Communications II (1 Credit)
Teaches students how to communicate quantitative information effectively. Focuses on developing written, spoken and presentation skills.
Restriction: Must be in Business and Management (Master's) program; or permission of BMGT-Robert H. Smith School of Business.
Credit Only Granted for: BUMK758G or BUMK764.
Formerly: BUMK758G.

BUMK766 Digital Analytics (2 Credits)
Examines the process of developing, implementing and analyzing strategies for successfully marketing a variety of existing and potential products and services on the Internet. Special attention is devoted to the tools and techniques unique to the electronic media.
Restriction: Must be in Business and Management (Master's) program; or permission of BMGT-Robert H. Smith School of Business.
Credit Only Granted for: BUMK758N or BUMK766.
Formerly: BUMK758N.

BUMK770 Retail Analytics (2 Credits)
Planning and implementing retail marketing strategies often involve sophisticated analytics. This course will teach the analytical tools needed to develop retail strategies. Both store and non-store (catalog, Internet) retailing are discussed. Also, students will learn how to evaluate the impact of environmental trends in the consumer market, competition, the economy and technology on retail strategy in the U.S. and global market.
Restriction: Must be in Business and Management (Master's) program; or permission of BMGT-Robert H. Smith School of Business.
Credit Only Granted for: BUMK758M or BUMK770.
Formerly: BUMK758M.

BUMK772 Innovation Analytics (2 Credits)
The economic success of many firms depends on their ability to accurately identify needs of their customers andefficiently innovate -- i.e., develop new products, new services, or new processes -- in order to meet those needs.Achieving this goal is a multi-disciplinary initiative. In this course, we focus on key analytics driven decisions faced bymanagers when approaching this important task of innovation from the customer centric perspective of a marketer.
Restriction: Must be in Business and Management (Master's) program; or permission of BMGT-Robert H. Smith School of Business.
Credit Only Granted for: BUMK758Y or BUMK772.
Formerly: BUMK758Y.

BUMK773 Pricing Analytics and Strategies (2 Credits)
The economic and behavioral aspects of pricing and the evaluation of innovative pricing practices such as price matching, customized pricing, bundle pricing and product line pricing. The course will cover both B2B, B2C, online and offline markets. Instruction will be through a mix of case studies, pricing simulation games, hands-on exercises, practitioner guest lectures and discussions.
Restriction: Must be in Business and Management (Master's) program; or permission of BMGT-Robert H. Smith School of Business.
Credit Only Granted for: BUMK758J or BUMK773.
Formerly: BUMK758J.

BUMK774 Market Forecasting (2 Credits)
Market forecasting methods for different contexts. Focus on quantitative modeling techniques based on established statistical methods. Non-statistical methods used when empirical data is scarce. This is a very hands-on class where students will apply the forecasting methods learned to real data.
Restriction: Must be in Business and Management (Master's) program; or permission of BMGT-Robert H. Smith School of Business.
Credit Only Granted for: BUMK758A or BUMK774.
Formerly: BUMK758A.

BUMK776 Action Learning Project (2 Credits)
Students analyze marketing data, report their findings and provide appropriate recommendations.
Restriction: Must be in Business and Management (Master's) program; or permission of BMGT-Robert H. Smith School of Business.
Credit Only Granted for: BUMK758Q or BUMK776.
Formerly: BUMK758Q.

BUMK790 Business Communications (2 Credits)
Through analysis and practice of communication strategies adopted by business professionals, students learn to create compelling written, oral, and visual presentations centered around data.
Restriction: Must be in a Business and Management (Master's) program; or permission of BMGT-Robert H Smith School of Business.

BUMO - Management and Organization

BUMO600 Leadership and Teamwork (2 Credits)
Course examines concepts of team-building and leadership which are critical to managerial success. Topics include leadership, decision making, communication and conflict, work motivation, building effective teams, and organizational change and culture.
Restriction: Must be admitted to the appropriate graduate business program; or permission of the Masters Programs Office at the Robert H. Smith School of Business.

BUMO602 Financial Accounting (2 Credits)
Overview of financial accounting, periodic financial statements and the financial reporting process. Importance of financial statements as information source for creditors and investors and as a means by which managers can communicate information about their firms.
Restriction: Must be admitted to the appropriate graduate business program; or permission of the Masters Programs Office at the Robert H. Smith School of Business.

BUMO604 Managerial Economics and Public Policy (2 Credits)
Basic microeconomic principles used by firms, including supply and demand, elasticities, costs, productivity, pricing, market structure and competitive implications of alternative market structures. Market failures and government intervention. Public policy processes affecting business operations.
Restriction: Must be admitted to the appropriate graduate business program; or permission of the Masters Programs Office at the Robert H. Smith School of Business.

BUMO606 Making Better Business Decisions with Data (2 Credits)
The goal of the course is to provide students with a toolkit for linking data analysis and strategic decision making. Even while there is an increasing proliferation of data and analysis tools, making informed predictions about how and when policy decisions will influence performance outcomes is challenging. Making informed decisions requires: a) understanding the basics of data structures, variables, and relationships; b) a conceptual understanding of when and why correlations can (and cannot) be interpreted as causal; c) the application of research design solutions for common inferential pitfalls; and d) facility with credible research and reporting practices.
Restriction: Must be admitted to the appropriate graduate business program; or permission of the Masters Programs Office at the Robert H. Smith School of Business.

BUMO610 Financial Management (2 Credits)
Focuses on the valuation of the real assets of firms as well as the valuation of stocks and bonds, the primary financial assets in an economy. While details vary, the conceptual foundations of valuation boil down to three themes: time value of money, no-arbitrage, and systematic risk.
Restriction: Must be admitted to the appropriate graduate business program; or permission of the Masters Programs Office at the Robert H. Smith School of Business.

BUMO612 Marketing Management (2 Credits)
Analysis of marketing problems and evaluation of specific marketing efforts regarding the organization's products and services, pricing activities, channel selection, and promotion strategies in both domestic and international markets.
Restriction: Must be admitted to the appropriate graduate business program; or permission of the Masters Programs Office at the Robert H. Smith School of Business.

BUMO614 Strategic Management (2 Credits)
Analyze and identify profit opportunities and threats in different industry and competitive environments; Analyze and identify a firm's valuable assets, resources and capabilities and how they might be protected, leveraged, and extended in the market; Learn how to organize your company to be the best prepared to adapt its strategy over time as the market environment changes; and how to use organic growth as well as mergers, acquisitions, joint ventures, alliances, and divestitures to ensure that the firm maintains the proper scale and scope to compete effectively over time.
Restriction: Must be admitted to the appropriate graduate business program; or permission of the Masters Programs Office at the Robert H. Smith School of Business.

BUMO701 Marketing Research Methods (2 Credits)
Timely and quality information is crucial for the success of firms in today's highly competitive and evolving environment. Marketing research is an organized way of developing and providing information for managerial decision-making. An important objective of the course is to develop a solid understanding of contemporary marketing research methods that are widely used in practice. By the end of this course, students will be able to better understand the marketing research produced by others, as well as to develop essential skills to conduct their own marketing research.
Restriction: Must be admitted to the appropriate graduate business program; or permission of the Masters Programs Office at the Robert H. Smith School of Business.

BUMO702 Managerial Staffing (3 Credits)
Aimed at increasing an understanding of the legal, technical, and practical issues involved in organizational staff forecasting, and hiring and termination procedures.
Credit Only Granted for: BMGT783 or BUMO702.
Formerly: BMGT783.

BUMO703 Consumer Behavior (2 Credits)
The study of consumer behavior is the study of the processes involved when individuals (or groups) select, purchase, use, and share products, services, or experiences to satisfy needs. This course is intended to enhance your understanding of consumer behavior and how it can be utilized by marketing practitioners to develop more effective marketing strategies. We use the Customer Journey framework as the basis for analyzing consumer behavior. We examine the psychological processes at each stage of the customer journey, identify relevant touchpoints based on these psychological processes, and consider how firms can affect the consumer via those touchpoints. Observing and thinking about your daily consumption choices will enhance your understanding of consumer behavior.
Restriction: Must be admitted to the appropriate graduate business program; or permission of the Masters Programs Office at the Robert H. Smith School of Business.

BUMO704 Problems and Applications in Human Resource Management (3 Credits)
Applications in the design, implementation, and evaluation of human resource management programs. Experiential learning activities and simulations.
Prerequisite: BUSI663.
Credit Only Granted for: BMGT761 or BUMO704.
Formerly: BMGT761.

BUMO705 Brand Management (2 Credits)
Brand names are valuable assets for firms. Effective brand management is critical to maintaining the long-term profitability of products and services. Topics include understanding brands from the customer's perspective, building, measuring, and leveraging brand equity, managing brand portfolios, and managing brands over time.
Prerequisite: BUMO612.
Restriction: Must be admitted to the appropriate graduate business program; or permission of the Masters Programs Office at the Robert H. Smith School of Business.

BUMO711 Navigating Organizational Networks (2 Credits)
Networks play a critical role in information sharing, social support, personal and professional growth and advancement, and influence within organizations. In this class, you will gain theoretical and practical knowledge on networks - how they are developed, the functions they serve, challenges individuals face related to their networks, and more. You will also do a deep dive on your own network - assessing the current state, strengths, gaps and opportunities. You will gain both knowledge and new skills on connecting meaningfully in order to grow your network and influence others. You will leave the class with deeper self-knowledge and a clear plan for continuing to evolve and nurture your network in the future.
Restriction: Must be admitted to the appropriate graduate business program; or permission of the Masters Programs Office at the Robert H. Smith School of Business.

BUMO713 Organizational Change (2 Credits)
This course aims to provide useful diagnostic tools, intervention strategies, and change models to understand and manage organizational change and its core processes, as well as critical knowledge and skills to initiate and facilitate an organizational change as effective change agent.
Restriction: Must be admitted to the appropriate graduate business program; or permission of the Masters Programs Office at the Robert H. Smith School of Business.

BUMO714 Competitive and Collaborative Negotiation (2 Credits)
The course is designed to complement other skills you have developed in different courses at the Smith School of Business, with the basic premise that negotiation skills are needed to implement any technical or analytical solution to different problems at the workplace.
Restriction: Must be admitted to the appropriate graduate business program; or permission of the Masters Programs Office at the Robert H. Smith School of Business.

BUMO715 Advanced Negotiation Challenges (2 Credits)
Practice negotiations using multiple media (email, phone). Multiple party negotiations. Cross-cultural negotiations.
Corequisite: BUMO714.
Restriction: Must be in one of the following programs (Business and Management (Master's); Business and Management (Master's)).

BUMO716 Foundations of Consulting (2 Credits)
Foundations of Consulting is designed to help students develop the three essential skills for a successful consulting career: teamwork, analysis, and presentation skills. Students will develop these three skills through class discussion, individual exercises, and applied team exercises with a real client.
Restriction: Must be admitted to the appropriate graduate business program; or permission of the Masters Programs Office at the Robert H. Smith School of Business.

BUMO720 Understanding Organizational Change (2 Credits)
Develops the fundamental change knowledge and skills of MBA students who plan to work with organizations as change agents, whether internally as managerial employees or externally as outside consultants. Draws on literatures from organizational behavior, human resource management and strategic management to identify models as prescriptions of change.
Prerequisite: BUSI664 or BUSI662.
Restriction: Must be in one of the following programs (Business and Management (Master's); Business and Management (Master's)).

BUMO721 Sports, Sales and Sponsorship (2 Credits)
The goal of this class is to give students an understanding of Sports Sales and Sponsorships., Students will discuss and analyze the multi-faceted sports sponsorship landscape of naming rights, major partnerships, and activation. Through a combination of reading, guest speakers, case studies, discussion and hands on participation, students will come away with an improved understanding of Sports Sales/ Sponsorship.
Restriction: Must be admitted to the appropriate graduate business program; or permission of the Masters Programs Office at the Robert H. Smith School of Business.

BUMO722 Organizational Behavior: A Multicultural Perspective (3 Credits)
Study of organizational behavior from a multicultural perspective.
Credit Only Granted for: BMGT765 or BUMO722.
Formerly: BMGT765.

BUMO723 NIL (Name, Image and Likeness) (2 Credits)
On July 1, 2021 new legislation was passed that allowed student-athletes to monetize their name, image and likeness (NIL) while still keeping their NCAA eligibility. The class will focus on the changing landscape for student-athletes, athletic departments and sponsors as they navigate these new waters. Student-athletes as "brands" and entrepreneurs will be explored as they look to leverage their social media following and engagement,. The class will feature lectures, guest speakers and hands on assignments.
Restriction: Must be admitted to the appropriate graduate business program; or permission of the Masters Programs Office at the Robert H. Smith School of Business.

BUMO724 Global Sports Entrepreneurship (2 Credits)
The goal of this class is to give students an understanding of Sports Entrepreneurship and it's impact across the Globe. Students will learn the core components of a sports business plan and how to ideate and bring to market a sports business venture. Through a combination of reading, guest speakers, case studies, discussion and hands on participation, students will walk away with an improved understanding of entrepreneurship and the foundation to apply it in a variety of professional contexts.
Restriction: Must be admitted to the appropriate graduate business program; or permission of the Masters Programs Office at the Robert H. Smith School of Business.

BUMO725 Networks and Influence (2 Credits)
Focuses on networks, social capital, and influence as they relate to operating effectively in organizations. It draws heavily on emerging literature related to social capital and networks, but also integrates concepts from persuasion, communication, and motivation literatures to aid your efforts to build a successful track record for yourself and your organization.
Restriction: Must be in Business and Management (Master's) program.
Credit Only Granted for: BUMO725 or BULM732.

BUMO726 Operations and Events Management (2 Credits)
Class will provide students with an understanding of the management process as it relates to the use and provision of sport facilities. Topics and discussions will include management theories and strategies, financial management, evaluation and contemporary issues related to the operation of traditional and unique facilities.
Restriction: Must be admitted to the appropriate graduate business program; or permission of the Masters Programs Office at the Robert H. Smith School of Business.

BUMO727 The Entrepreneur and the Entrepreneurial Team (3 Credits)
The entrepreneur and the entrepreneurial team: the entrepreneur and the team as it relates to innovation, change, power, and risk-taking. Entrepreneurs and their teams from a variety of different firms present and discuss their views on leadership.
Prerequisite: Completion of MBA core requirements; and permission of BMGT-Robert H. Smith School of Business.
Credit Only Granted for: BMGT781 or BUMO727.
Formerly: BMGT781.

BUMO731 Foundations of AI (2 Credits)
Artificial Intelligence is transforming business and society at an unprecedented scale. While consumer applications such as face recognition for devices, image tagging on social media, or ChatGPT for information (and entertainment) have fast demonstrated value, there are more serious questions/concerns regarding AI's broader business and societal use. While the opportunities are indeed tremendous (with AI impacting trillions of dollars in value creation per some estimates) there is widespread recognition that there are major challenges ahead. Obtaining returns on investment from AI will not be trivial, and will need intentional design and a deep understanding of the capabilities of key technologies. This course presents students with key foundational concepts that underlie Artificial Intelligence in order to prepare them to be better managers who can make decisions regarding AI design, development and use.
Restriction: Must be admitted to the appropriate graduate business program; or permission of the Masters Programs Office at the Robert H. Smith School of Business.

BUMO732 Entrepreneurship and New Ventures (2 Credits)
Provides an introduction to important tools and skills necessary to create and grow a successful new venture. Integrates research findings from a range of different practical and intellectual perspectives, including psychology, sociology, economics, strategic management, and history into practical, hands on lessons for an entrepreneur. Class projects provide the foundations for new, real businesses.
Credit Only Granted for: BUMO732 or BUSI660.
Formerly: BMGT780.

BUMO733 AI & Business Strategy (2 Credits)
Executives are leveraging digital transformation initiatives across almost all organizations in every conceivable industry to grapple with a variety of problems to build flexibility and resilience. Artificial Intelligence (AI), in a near-unprecedented manner, is opening up new possibilities - in some cases, the likes of which we never imagined previously. This course will address a need in industry, and in broader society, to harness AI to achieve transformative outcomes. The focus will be on understanding AI-specific issues that relate to the need for specific business strategies. This will involve examples of the use of AI in specific industries and applications, effective decision-making frameworks that incorporate AI and humans, verification and evaluation of AI initiatives, risk & responsible use, regulatory aspects and broader governance issues. Classes will be a mix of lectures, case discussions, flipped formats and student presentations.
Restriction: Must be admitted to the appropriate graduate business program; or permission of the Masters Programs Office at the Robert H. Smith School of Business.

BUMO743 Technology Transfer Commercialization Strategies (3 Credits)
Viewing technology as a strategic resource of the firm, students develop an understanding of the processes, risks, and rewards of technology commercialization. Student teams are organized to review and select a technological innovation and then determine its commercial viability in the market place.
Restriction: Must be in Business and Management (Master's) program.
Credit Only Granted for: BMGT785 or BUMO743.
Formerly: BMGT785.

BUMO744 Creation of High Potential Ventures (3 Credits)
This course focuses on the real life experiences of high profile technology entrepreneurs. Guest entrepreneurs and book review reveal patterns of personal preparation, strategic decision-making, and action that have produced ventures with high value-added and significant regional and national impact.
Restriction: Must be in Business and Management (Master's) program.
Credit Only Granted for: BMGT787 or BUMO744.
Formerly: BMGT787.

BUMO748 Business Plan Review (3 Credits)
Evaluation of real business plans submitted to the Dingman Center for Entrepreneurship. Practicing venture capitalist and professors focus on business plan critique and writing skills, venture capitalist screening practices, and the structure of electronic commerce. Past business plan reviews are analyzed according to the business model, target market, competitive advantages/threats, stage of development, management team and financial status. Real investment decisions are made on the basis of student recommendations. Subject companies are contacted and evaluated.
Repeatable to: 6 credits.
Formerly: BMGT796.

BUMO751 Implementing Strategy: Organizing to Compete (2 Credits)
Organizational dynamics of competitive advantage. Impact of alternative organizational structures, planning and control systems, human resource management practices, and executive leadership styles on the implementation of archetypically different strategies.
Prerequisite: Must have completed or be concurrently enrolled in BUSI690. And must have completed MBA core requirements; or permission of BMGT-Robert H. Smith School of Business.

BUMO752 Strategic Growth for Emerging Companies (2 Credits)
Explores the key elements of mastering the move from being a successful small company to achieving industry significance. Supplemented by readings, video and guest speakers, the course highlights the application of practical lessons leading to strategic growth and subsequent emergence as a player.
Restriction: Must be in Business and Management (Master's) program.

BUMO753 Emerging Business Formation (2 Credits)
Business formation issues, legal obligations that affect entrepreneurial activities, the spectrum of financing methods available to emerging businesses, creating management and organization and a practical application of the tools through practical projects.
Restriction: Must be in one of the following programs (Business and Management (Master's); Business and Management (Master's)).

BUMO754 Global Strategy (2 Credits)
Focuses on the "strategic" and "organizational" questions that a company must address as it globalizes its footprint. Among the questions that will be addressed are: What are the potential benefits, costs, and risks associated with going abroad? What differentiates a "global" from a "multidomestic" industry? What are the sources of competitive advantage in a global context?
Credit Only Granted for: BUSI674, BUMO754, or BMGT710.

BUMO756 Industry Analysis (2 Credits)
Conceptual framework and analytical tools for understanding the dynamics of industry structure. Impacts of past and future attractiveness of the industry on profitability. Developing and applying frameworks to devise competitive strategies in uncertain industries.
Recommended: BUSI690.
Restriction: Must be in one of the following programs (Business and Management (Master's); Business and Management (Master's)).
Credit Only Granted for: BMGT792 or BUMO756.
Formerly: BMGT792.

BUMO757 Competitor Analysis (2 Credits)
Understanding of the dynamics of how competitors interact in the marketplace. Understanding economic and behavioral motivations of industry players to design more effective strategies.
Recommended: BUSI690.
Restriction: Must be in one of the following programs (Business and Management (Master's); Business and Management (Master's)).

BUMO758 Special Topics in Management and Organization (1-4 Credits)
Selected advanced topics in the various fields of graduate study in management and organization.
Restriction: Permission of BMGT-Robert H. Smith School of Business.
Repeatable to: 9 credits if content differs.
Formerly: BMGT798.

BUMO759 Independent Study in Management and Organization (1-6 Credits)
Independent study for Masters students in management and organization.
Repeatable to: 6 credits if content differs.
Formerly: BMGT708.

BUMO761 Creativity for Business Leaders and Entrepreneurs (2 Credits)
Examines the concept of creativity as it applies in today's and tomorrow's complex business environment. An overview of the cognitive foundations of creativity, examines many of the preconceived notions about creativity in business and discusses multiple ways in which creativity can help business leaders and entrepreneurs to succeed. Topics include creativity techniques for groups and individuals, creativity as a foundation to recognize business opportunities and develop innovative products and services, selecting ideas and making them stick, mental and organizational obstacles to creativity as well as an overview of electronic tools to increase creative capability.
Restriction: Must be in one of the following programs (Business and Management (Master's); Business and Management (Master's)).
Credit Only Granted for: BUSI661 or BUMO761.
Formerly: BUSI661.

BUMO767 Cross-Cultural Communication and Teamwork (2 Credits)
Provide managers a sound basis for developing such competencies. Specifically, we will develop an understanding of key cultural differences, and how these differences influence the management of individuals, groups, and organizations.
Restriction: Must be in one of the following programs (Business and Management (Master's); Business and Management (Master's)) ; or permission of BMGT-Robert H. Smith School of Business.
Credit Only Granted for: BUSI667 or BUMO767.
Formerly: BUSI667.

BUMO780 Business Ethics (2 Credits)
This class is designed to help you reflect about your own values, to give you a substantive background about ethical pitfalls, and to specifically highlight the unexpected ways in which the work context that we operate in can affect our decisions and behaviors in ways that sometimes detach us from our own values
Restriction: Must be admitted to the appropriate graduate business program; or permission of the Masters Programs Office at the Robert H. Smith School of Business.

BUMO782 Entrepreneurship and New Ventures (2 Credits)
This course introduces students to the principles and practices of entrepreneurship, emphasizing opportunity recognition, customer discovery, business model development, and venture financing. Through cases, projects, and experiential learning, students develop the analytical, creative, and leadership skills required to launch new ventures or drive innovation within existing organizations. The course cultivates an entrepreneurial mindset focused on value creation, adaptability, and decision-making in uncertain environments.
Restriction: Must be admitted to the appropriate graduate business program; or permission of the Masters Programs Office at the Robert H. Smith School of Business.

BUMO783 International Business (2 Credits)
The international business environment as it affects company policy and procedures. In-depth analysis and comprehensive case studies of the business functions undertaken in international operations.
Restriction: Must be admitted to the appropriate graduate business program; or permission of the Masters Programs Office at the Robert H. Smith School of Business.

BUMO785 Valuation in Corporate Finance (2 Credits)
An advanced topics course in Corporate Finance dealing with valuation. Main topics will be, building pro forma statements, cost of capital, using ratios and comparable to value projects and firms, discounted cash flow valuations, WACC and APV methods of valuation and Real Option Valuations.
Restriction: Must be admitted to the appropriate graduate business program; or permission of the Masters Programs Office at the Robert H. Smith School of Business.

BUMO790 Experiential Learning I (2 Credits)
The first part of the class will consist of meeting industry experts in sports management, arts management, consulting, strategy, and more while engaging in weekly individual reflections. This aspect of the class (which spans over 7 weeks Term B) will culminate into a choice of industry to partner with for a consulting capstone project.
Prerequisite: Permission of BMGT-Robert H. Smith School of Business.
Restriction: Must be admitted to the appropriate graduate business program; or permission of the Masters Programs Office at the Robert H. Smith School of Business.

BUMO791 Experiential Learning II (2 Credits)
The second part (spans over 7 weeks Term D) of the class will be dedicated to a consulting project with a client. In this part of the class, students will examine consulting processes, tools, and theories they have acquired throughout their studies in the Master of Science in Business and Management, and apply them to a client project, culminating in a realistic solution deliverable to the client as well as students' reflections and synthesis of their learning.
Restriction: Must be admitted to the appropriate graduate business program; or permission of the Masters Programs Office at the Robert H. Smith School of Business.

BUMO794 Essentials of Negotiation (2 Credits)
This highly experiential course will improve students' negotiation skills and capacity to acquire and effectively use bargaining power. By using a variety of assessment tools, feedback sources, skill-building exercises, and exercise debriefings, the class will increase students' negotiating self-confidence and improve their capacity to claim value and achieve win-win solutions to individual, team, and organizational problems. The course is designed to enhance students' negotiating self-confidence and improve students' analytical and decision-making skills (e.g., understanding bargaining zones, knowing when an agreement can be made and when to walk away; learning how to prepare for negotiations), interpersonal skills, creativity (e.g., identifying creative solutions to conflict), and persuasive abilities.
Restriction: Must be in Business and Management (Master's) program.
Credit Only Granted for: BUMO794 or BUAC723.

BUMO796 Leadership and Human Resource Management for Accountants and Auditors (3 Credits)
Develops the concepts, frameworks, and skills that are important to be effective leaders and to successfully manage human resources. Topics for discussion include: Creating a motivating and empowering environment; leadership attributes, power and effective influence; building effective decision-making; strategic management of human resources; specification of the skills and competencies requisite for job success; recruiting and selecting employees to fit the job and the organization; measuring, appraising and improving performance. All of the topics selected for discussion are critical ones that every professional needs to know, regardless of functional area (not just HR professionals), and will help students become more effective consultants, managers and leaders.
Restriction: Must be in Business and Management (Master's) program.
Credit Only Granted for: BUMO796 or BUAC725.

BUSI - Part-Time MBA Program

BUSI600 Fundamentals of Business Decision Making (2 Credits)
Introduces students to the language of business. Topics covered include financial accounting, financial management, data models, strategy, leadership and teamwork, and a brief action learning project on innovation.
Restriction: Must be in Business and Management (Master's) program OR Permission of BMGT-Robert H. Smith School of Business.
Additional Information: Pre-work includes the DISC assessment, and a requires a passing grade on a spreadsheet pre-work course.

BUSI604 Business Communication (2 Credits)
Develop the ability to communicate with and about data.
Restriction: Must be in Business and Management (Master's) program OR Permission of BMGT-Robert H. Smith School of Business.

BUSI608 ELM: Special Topics (0 Credits)
Selected advanced topics in the various fields of graduate study in business and management.
Restriction: Must be in one of the following programs (Business and Management (Master's); Business and Management (Master's)).
Formerly: BMGT608.

BUSI610 Introduction to Financial Accounting (2 Credits)
Overview of financial accounting, periodic financial statements and the financial reporting process. Importance of financial statements as information source for creditors and investors and as a means by which managers can communicate information about their firms.
Restriction: Must be in one of the following programs (Business and Management (Master's); Business and Management (Master's)).
Credit Only Granted for: BUSI610, BUAC602, BUFN602, or BMGT602.

BUSI611 Managerial Accounting (2 Credits)
Use of accounting data in corporate planning and control. Cost-volume-profit analysis, budgeting, pricing decisions and cost data, transfer pricing, activity-based management, performance measures, and standard costing.
Prerequisite: BUSI610.
Restriction: Must be in one of the following programs (Business and Management (Master's); Business and Management (Master's)).
Credit Only Granted for: BUSI611, BUAC616, or BMGT616.

BUSI621 Digital Transformation in Business (2 Credits)
Introduces students to the strategic role of digital transformation within businesses, and provides an overview for how major information technologies may be used to inform and transform the firm's strategic, operational, and tactical decisions. Topics discussed in the course include the strategic use of digital technologies to generate sustainable competitive value; the contributions of new forms of technology infrastructure; the evaluation of new technology investments and the resulting ROI; acquiring, managing and governing technological capabilities within the firm; understanding the role of enterprise systems and social technologies within the firm; and the management of disruptive technologies within and outside the firm.
Restriction: Must be in Business and Management (Master's); or permission of BMGT-Robert H Smith.
Credit Only Granted for: BUSI621 or BUSO620.

BUSI622 Managing Digital Business Markets (2 Credits)
The objective is to understand the strategic and tactical issues involved in managing digital businesses and markets. Also, some of the characteristics of digital businesses and markets that make them unique and understand how companies can best manage them will be examined.
Restriction: Must be in one of the following programs (Business and Management (Master's); Business and Management (Master's)) ; or permission of BMGT-Robert H. Smith School of Business.

BUSI630 Data Driven Decision Making (2 Credits)
Analytical modeling of business decisions; uncertainty, risk and expected utility; regression modeling to infer relationships among variables.
Restriction: Must be in one of the following programs (Business and Management (Master's); Business and Management (Master's)).

BUSI631 Data Driven Decision Making II (2 Credits)
Analytical modeling of business decisions; uncertainty, risk and expected utility; regression modeling to infer relationships among variables.
Restriction: Must be in Business and Management (Master's) program OR Permission of BMGT-Robert H. Smith School of Business.

BUSI634 Operations Management (2 Credits)
Operations management is concerned with efficient and effective design and operation of business processes for delivering products and/or services. Emphasis is given to process analysis and design, capacity management and bottlenecks, waiting lines and the impact of uncertainty in process performance, quality management, lean, six-sigma, and revenue management.
Restriction: Must be in one of the following programs (Business and Management (Master's); Business and Management (Master's)) ; or permission of BMGT-Robert H. Smith School of Business.
Credit Only Granted for: BUSI634 or BMGT624.

BUSI640 Corporate Finance (2 Credits)
Focuses on the valuation of the real assets of firms as well as the valuation of stocks and bonds, the primary financial assets in an economy. While details vary, the conceptual foundations of valuation boil down to three themes: time value of money, no-arbitrage, and systematic risk.
Restriction: Must be in one of the following programs (Business and Management (Master's); Business and Management (Master's)).

BUSI641 Corporate Finance II (2 Credits)
Builds on the concepts and analytic methods covered in Corporate Finance I. Students will learn about the structure of financial markets, the financing and payout choices of large and small corporations, and the role of risk management in the corporation. In particular, the following issues will be addressed: The drivers of shareholder value; Corporate financing alternatives and the design of a company's capital structure; Coordinating investment, financing and payout policies; Corporate Finance Issues for Start-up firms; Key issues in international corporate finance.
Prerequisite: BUSI640.
Restriction: Must be in Business and Management (Master's) program OR Permission of BMGT-Robert H. Smith School of Business.

BUSI650 Marketing Management (2 Credits)
Analysis of marketing problems and evaluation of specific marketing efforts regarding the organization's products and services, pricing activities, channel selection, and promotion strategies in both domestic and international markets.
Restriction: Must be in one of the following programs (Business and Management (Master's); Business and Management (Master's)).
Credit Only Granted for: BUSI650 or BMGT612.

BUSI662 Leadership and Teamwork (2 Credits)
Course examines concepts of team-building and leadership which are critical to managerial success. Topics include leadership, decision making, communication and conflict, work motivation, building effective teams, and organizational change and culture.
Restriction: Must be in one of the following programs (Business and Management (Master's); Business and Management (Master's)).
Credit Only Granted for: BMGT600, BUSI662, or BUSM600.

BUSI672 Global Supply Chain Management (2 Credits)
Offers a practical blueprint for understanding, building, implementing, and sustaining supply chains in today's rapidly changing global supply chain environment. It will provide the student with a survey of the fast-moving Supply Chain Management discipline and practice, including the evolution of supply chain strategies, business models and technologies; current best practices in demand and supply management; and methodologies for conducting supply chain-wide diagnostic assessments and formulating process improvement plans.
Restriction: Must be in one of the following programs (Business and Management (Master's); Business and Management (Master's)).
Credit Only Granted for: BUSI672 or BMGT740.

BUSI673 International Economics for Managers (2 Credits)
Focuses on understanding critical aspects of the global business environment that influence firm decisions and behavior. Globalization is present in market competition, capital markets, and managerial talent as evidenced by free trade areas and economic unions forming, the volatility in global financial markets, and the continued rise of transnational firms. With globalization, the challenge for firms is to acknowledge, understand and act when appropriate - to act by sourcing, lobbying, and relocating value chain activities internationally.
Restriction: Must be in one of the following programs (Business and Management (Master's); Business and Management (Master's)).

BUSI681 Managerial Economics and Public Policy (2 Credits)
Basic microeconomic principles used by firms, including supply and demand, elasticities, costs, productivity, pricing, market structure and competitive implications of alternative market structures. Market failures and government intervention. Public policy processes affecting business operations.
Restriction: Must be in one of the following programs (Business and Management (Master's); Business and Management (Master's)).
Credit Only Granted for: BUSI681 or BMGT604.

BUSI683 The Global Economic Environment (2 Credits)
Relationship between national and international economic environments. Determinants of output, interest rates, prices and exchange rates. Analysis of effect of economic policies (fiscal, monetary, trade, tax) on the firm and the economy.
Restriction: Must be in one of the following programs (Business and Management (Master's); Business and Management (Master's)).

BUSI690 Strategic Management (2 Credits)
Analyze and identify profit opportunities and threats in different industry and competitive environments; Analyze and identify a firm's valuable assets, resources and capabilities and how they might be protected, leveraged, and extended in the market; Learn how to organize your company to be the best prepared to adapt its strategy over time as the market environment changes; and how to use organic growth as well as mergers, acquisitions, joint ventures, alliances, and divestitures to ensure that the firm maintians the proper scale and scope to compete effectively over time.
Restriction: Must be in one of the following programs (Business and Management (Master's); Business and Management (Master's)).
Credit Only Granted for: BUSI690 or BMGT614.

BUSI698 MBA Consulting Project (3-6 Credits)
Experiental research project in the identification of management problems, the evaluation of alternative solutions, and the recommendation for management.
Restriction: Must be in one of the following programs (Business and Management (Master's); Business and Management (Master's)).
Repeatable to: 9 credits if content differs.
Formerly: BMGT698.

BUSI700 Financial Statement Analysis (2 Credits)
Provides students with the tools to conduct a financial statement analysis, which is part of an overall business analysis. This involves understanding and using the information that financial statements are communicating to users.
Restriction: Must be in Business and Management (Master's) program OR Permission of BMGT-Robert H. Smith School of Business.

BUSI702 Strategic Growth for Emerging Companies (2 Credits)
Explores the key elements of mastering the move from being a successful small company to achieving industry significance. Supplemented by readings, video and guest speakers, the course highlights the application of practical lessons leading to strategic growth and subsequent emergence as a player.
Restriction: Must be in Business and Management (Master's) program OR Permission of BMGT-Robert H. Smith School of Business.

BUSI710 Competitive and Collaborative Negotiation (2 Credits)
Increase negotiating self-confidence and improve capacity to achieve win-win solutions to organizational problems. Improve effectiveness at finding creative solutions to conflict.
Restriction: Must be in Business and Management (Master's) program OR Permission of BMGT-Robert H. Smith School of Business.

BUSI711 Industry Analysis (2 Credits)
Conceptual framework and analytical tools for understanding the dynamic of industry structure. Impacts of past and future attractiveness of the industry on profitability. Developing and applying frameworks to devise competitive strategies in uncertain industries.
Recommended: BUSI690.
Restriction: Must be in Business and Management (Master's) program OR Permission of BMGT-Robert H. Smith School of Business.

BUSI712 Entrepreneurship and New Ventures (2 Credits)
Provides an introduction to important tools and skills necessary to create and grow a successful new venture. Integrates research findings from a range of different practical and intellectual perspectives, including psychology, sociology, economics, strategic management, and history into practical, hands on lessons for an entrepreneur. Class projects provide the foundations for new, real businesses.
Restriction: Must be in Business and Management (Master's) program OR Permission of BMGT-Robert H. Smith School of Business.

BUSI713 Global Strategy (2 Credits)
Focuses on the "strategic" and "organizational" questions that a company must address as it globalizes its footprint. Among the questions that will be addressed are: What are the potential benefits, costs, and risks associated with going abroad? What differentiates a "global" from a "multidomestic" industry? What are the sources of competitive advantage in a global context?
Restriction: Must be in Business and Management (Master's) program OR Permission of BMGT-Robert , H. Smith School of Business.

BUSI714 Innovation Management (2 Credits)
Designed to give students a broad view on issues related to the management of innovations. Covers both external dynamics of innovations and internal management activities, with special emphasis on knowledge development and learning processes within organizations.
Restriction: Must be in Business and Management (Master's) program OR Permission of BMGT-Robert H. Smith School of Business.

BUSI718 Special Topics in Business (1-4 Credits)
Selected advanced topics in the various fields of graduate study in business.
Restriction: Must be in Business and Management (Master's) program OR Permission of BMGT-Robert H. Smith School of Business.
Repeatable to: 15 credits if content differs.

BUSI721 Creativity for Business Leaders and Entrepreneurs (2 Credits)
Examines the concept of creativity as it applies in today's and tomorrow's complex business environment. An overview of the cognitive foundations of creativity, examines many of the preconceived notions about creativity in business and discusses multiple ways in which creativity can help business leaders and entrepreneurs to succeed. Topics include creativity techniques for groups and individuals, creativity as a foundation to recognize business opportunities and develop innovative products and services, selecting ideas and making them stick, mental and organizational obstacles to creativity as well as an overview of electronic tools to increase creative capability.
Restriction: Must be in Business and Management (Master's) program OR Permission of BMGT-Robert H. Smith School of Business.

BUSI730 Marketing Research Methods (2 Credits)
The process of acquiring, classifying and interpreting primary and secondary marketing data needed for intelligent, profitable marketing decisions. Evaluation of the appropriateness of alternative methodologies, such as the inductive, deductive, survey, observational, and experimental. Recent developments in the systematic recording and use of internal and external data needed for marketing decisions.
Prerequisite: BUSI650 and BUSI630.
Restriction: Must be in Business and Management (Master's) program OR Permission of BMGT-Robert H. Smith School of Business.

BUSI731 Managing Brands and Products (2 Credits)
Brand names are valuable assets for firms. Effective brand management is critical to maintaining the long-term profitability of products and services. Topics include understanding brands from the customer's perspective, building brand equity, measuring brand equity, leveraging brand equity, managing brand portfolios and managing brands over time.
Prerequisite: BUSI650.
Restriction: Must be in Business and Management (Master's) program OR Permission of BMGT-Robert , H. Smith School of Business.

BUSI732 Consumer Behavior (2 Credits)
Analysis of customer decision-making and how marketing strategy can be used to influence those decisions. The framework is a buyer behavior model, in which concepts from psychology, sociology, and economics are applied to individual and organizational purchase decisions. Marketing strategies of leading firms in consumer products, technology, and services (including internet services) are analyzed using a variety of case study formats. Focus is consumer behavior; however, principles can also be applied to the decision-making of business.
Prerequisite: BUSI650.
Restriction: Must be in Business and Management (Master's) program OR Permission of BMGT-Robert H. Smith School of Business.

BUSI734 Digital Marketing (2 Credits)
It has been a quarter century since the commercial use of the Internet and the World Wide Web began and during that time the business landscape has changed at a frenetic pace. Large multinational corporations such as Alphabet/Google, Facebook, Amazon, Alibaba and eBay, unheard of twenty years ago, have emerged as key players in our modern economy. In 2017 holiday season, online sales increased over 16 percent of overall spending online in 2016 with online retail spending in the U.S., the highest percentage since tracking began in 1999. Sales made through mobile devices have increased at a rapid rate to around 22 to 40 percent of all online sales. Corporations now highlight the importance of creating a digital relationship with customers. Moreover, digital technologies and devices such as smartphones, smart products, the Internet of Things, Artificial Intelligence, and deep learning all promise significant transformations of consumers lives in the near future. It is against this backdrop this course seeks to understand how the developments in digital technology are re-shaping the process and the strategy of marketing in the broad space we call digital marketing.
Restriction: Must be in Business and Management (Master's) program OR Permission of BMGT-Robert H. Smith School of Business.

BUSI735 Advanced Marketing Analytics (2 Credits)
Introduction to modeling tools used to support marketing analysis and decision making. Applications in strategic marketing, marketing segmentation, new product development, sales promotion analysis, pricing, design of marketing mix, sales force allocation, and direct marketing. Spreadsheet driven cases and illustrative readings.
Prerequisite: BUSI650.
Restriction: Must be in Business and Management (Master's) program OR Permission of BMGT-Robert H. Smith School of Business.

BUSI736 Pricing Strategies for Sustainable Competitive Advantage (2 Credits)
Pricing is one of the most important marketing decisions a firm faces. This course will help participants to develop pricing strategies using actual proven concepts, processes and techniques, to align pricing strategies with corporate goals and objectives, to determine the value customers assign to products and services using competitive pricing analysis, and to optimize pricing using customer segmenting strategies. The course will focus on both economic and behavioral aspects of pricing, and evaluation of innovative pricing practices such as price matching, customized pricing, bundle pricing and product line pricing, covering both B2B and B2C markets. Instruction will be through a mix of case studies, pricing simulation games, hands-on exercises and discussions. The course will provide participants with an in-depth understanding of state-of-the-art pricing strategies, practices and techniques for making profitable and sustainable pricing decisions.
Prerequisite: BUSI650.
Restriction: Must be in Business and Management (Master's) program OR Permission of BMGT-Robert H. Smith School of Business.

BUSI737 Innovation & Product Development (2 Credits)
Focuses on the development of innovations, new products or new services from the perspective of a marketer. For an innovation to be successful in the market, it has to be customer centric: hence, in this course, we study how to develop and bring to market elegant and efficient solutions to strong customer needs. This is a fundamental business challenge, faced while working in a startup or in an established company; when developing a new product or a new service; and when serving customers who are individuals or large corporations.
Prerequisite: BUSI650.
Restriction: Must be in Business and Management (Master's) program OR Permission of BMGT-Robert H. Smith School of Business.

BUSI740 Valuation in Corporate Finance (2 Credits)
An advanced topics course in Corporate Finance dealing with valuation. Main topics will be, building pro forma statements, cost of capital, using ratios and comparables to value projects and firms, discounted cash flow valuations, WACC and APV methods of valuation and Real Option Valuations.
Prerequisite: BUSI640.
Restriction: Must be in Business and Management (Master's) program OR Permission of BMGT-Robert H. Smith School of Business.

BUSI741 Financial Strategy for Corporations (2 Credits)
Advanced course in corporate finance, focusing on the issues that firms face when they plan to raise external capital from financial markets. The focus is on the financing problems faced by mid-market to large firms and on capital raised from public markets. The forms of external finance vary from simple debt or equity to more complex securities that bundle with an element of risk management.
Prerequisite: BUSI640.
Restriction: Must be in Business and Management (Master's) program OR Permission of BMGT-Robert H. Smith School of Business.

BUSI742 Entrepreneurial Finance and Private Equity (2 Credits)
Advanced course in Corporate Finance. The major emphasis is how financiers help growing firms - and in particular young start-ups - using different types of securities at different points in the industry's and firm's life. Financing arrangements and securities studied will include private equity funds and private financings placements, Venture Capital (VC) and preferred equity, Investment Banks through Initial Public Offerings (IPOs), Private equity finds, debt and leveraged buyouts. Students will learn additional techniques that will help them understand how financiers value firms and how to understand, plan and value different financing strategies.
Prerequisite: BUSI640.
Restriction: Must be in Business and Management (Master's) program OR Permission of BMGT-Robert H. Smith School of Business.

BUSI743 Applied Equity Analysis (2 Credits)
Students will learn to analyze equity securities using the basic EIC (Economy/Industry/Company) framework used in the financial industry, paying special attention to financial statement analysis. Students also will learn the primary valuation techniques used to estimate market values for equity securities.
Prerequisite: BUSI640.
Restriction: Must be in Business and Management (Master's) program OR Permission of BMGT-Robert H. Smith School of Business.

BUSI744 Derivative Securities (2 Credits)
Standard types of derivatives contracts are presented, and illustrated as to how they are used in practice. The theory of pricing these contracts is then presented in detail. The use of static and dynamic replication strategies, and the concept of no-arbitrage strategies is illustrated in numerous ways. Standard valuation techniques are covered, and standard formulas are presented. The theory is then applied to develop specific pricing and hedging strategies for various types of derivatives on different underlying assets. The management of the exposure of various risks is covered in detail as well.
Prerequisite: BUSI640.
Restriction: Must be in Business and Management (Master's) program OR Permission of BMGT-Robert H. Smith School of Business.

BUSI745 Fixed Income Analysis (2 Credits)
Describes important financial instruments which have market values that are sensitive to interest rate movements. Develops tools to analyze interest rate sensitivity and value fixed income securities. Defines and explains the vocabulary of the bond management business.
Prerequisite: BUSI640.
Restriction: Must be in Business and Management (Master's) program OR Permission of BMGT-Robert H. Smith School of Business.

BUSI746 International Investment (2 Credits)
Addresses international stock markets, portfolio theory, international interest rates, exchange rates and exchange rate derivatives (options, forwards, and futures), exchange rate swaps and exchange rate exposure (operating, translation, and transaction), foreign investment strategy.
Prerequisite: BUSI640.
Restriction: Must be in Business and Management (Master's) program OR Permission of BMGT-Robert H. Smith School of Business.

BUSI751 Decision Analytics (2 Credits)
Analytical modeling for managerial decisions using a spreadsheet environment. Includes linear and nonlinear optimization models, decision making under uncertainty and simulation models.
Prerequisite: BUSI630.
Restriction: Must be in Business and Management (Master's) program OR Permission of BMGT-Robert H. Smith School of Business.

BUSI752 Data Mining and Predictive Analytics (2 Credits)
Data mining techniques and their use in business decision making. A hands-on course that provides an understanding of the key methods of data visualization, exploration, classification, prediction, time series forecasting, and clustering.
Prerequisite: BUSI630.
Restriction: Must be in Business and Management (Master's) program OR Permission of BMGT-Robert H. Smith School of Business.

BUSI754 Social Media and Web Analytics (2 Credits)
Examines the process of developing, implementing, and analyzing strategies for successfully marketing a variety of existing and potential products and services using electronic media. Besides well-established Internet marketing tools such as e-mail, search engines and display advertising, a substantial part of the course is dedicated to understanding social media, analyzing successful social media strategies, and tracking their effectiveness. The course offers hands-on experience with many popular as well as emerging techniques unique to electronic media. Special attention is given to metrics appropriate for the new media.
Restriction: Must be in Business and Management (Master's) program OR Permission of BMGT-Robert H. Smith School of Business.

BUSI756 Managing Supply Chains: Models & Analysis (2 Credits)
Focuses on the strategic aspects of operations and supply chain management. Uses a framework for developing an operations strategy, and identify and analyze the key operations decisions which can have a major impact on a company's competitive position.
Prerequisite: BUSI630 and BUSI634.
Restriction: Must be in Business and Management (Master's) program OR Permission of BMGT-Robert H. Smith School of Business.

BUSI757 Pricing and Revenue Management (2 Credits)
Pricing is one of the most important and challenging business decisions with short-run and longrun implications. A specialized course on pricing and revenue management (PRM) is meant to provide you with the right bundle of tools and principles, drawn from several disciplines (Operations, Microeconomics, Decision Modeling, Statistics, Marketing, IS) to make effective pricing decisions. The topics covered in this course include economics of pricing, strategy and tactics of PRM, pricing optimization, differentiated pricing, dynamic pricing, using capacity controls in pricing, mark-down pricing, legal and ethical issues in pricing, B2B pricing, analysis of pricing processes, and applications of PRM in various industries. Emphasis is on both analytical models/methods used in making effective PRM decisions and managerial or organizational factors that hold the key to success in PRM.
Restriction: Must be in Business and Management (Master's) program OR Permission of BMGT-Robert H. Smith School of Business.

BUSI758 Special Topics in Business (1-4 Credits)
Selected advanced topics in the various fields of graduate study in business.
Prerequisite: Permission of BMGT-Robert H. Smith School of Business.
Repeatable to: 9 credits if content differs.
Formerly: BMGT798.

BUSI759 Independent Study in Business (1-6 Credits)
Independent study for Masters students in Business.
Repeatable to: 6 credits if content differs.
Formerly: BMGT708.

BUSI761 The Environment of International Business (2 Credits)
The international business environment as it affects company policy and procedures. In-depth analysis and comprehensive case studies of the business functions undertaken in international operations.
Credit Only Granted for: BMGT794 or BUSI761.
Formerly: BMGT794.

BUSI764 Business Law for Managers (2 Credits)
Survey of United States legal institutions and processes as well as substantive areas of the law that affect business. Examination of tort and contract law, the legal forms of business organization and legal liability and major regulatory laws that affect business.
Restriction: Must be in one of the following programs (Business and Management (Master's); Business and Management (Master's)) ; or permission of BMGT-Robert H. Smith School of Business.
Credit Only Granted for: BUSI764 or BUAC721.

BUSI771 New Venture Financing (2 Credits)
Development of skills for financing new ventures (both small and potentially large). Exploration of various funding sources. Criteria used in evaluation and decision process, including commercial banks, venture capital companies, small business investment companies, underwriters, private placement-financial consultants, mortgage bankers, and small business innovative research grants (U.S. Government).
Prerequisite: BUSI640; or permission of BMGT-Robert H. Smith School of Business.
Credit Only Granted for: BMGT740 or BUSI771.
Formerly: BMGT740.

BUSI781 Marketing Emergent Technology (1 Credit)
The many challenges and best practices of successfully marketing emergent technologies. The course will begin with a discussion of past successes and failures in marketing emergent technologies; followed by a study of the effective approaches and frameworks that help technology managers identify and understand customer needs. We will then focus on analyzing how the identified customer needs can guide design and development of emergent technologies. We will subsequently turn our attention to understanding how to translate customer needs and market conditions into effectively positioning our emergent technologies, with the intent of maximizing success when going to market.
Restriction: Must be in Business and Management (Master's) program; or permission of BMGT-Robert H Smith.

BUSI782 Science and Technology Project Valuation (2 Credits)
The application of financial management principles and techniques to science and technology investments and research and development projects. It will enable technology managers to estimate return on investment of R&D projects, value technology assets, quantify risk and make sound replacement and upgrade decisions for S&T projects. By the end of the course, students will be able to build financial models and make presentations to senior executives explaining the value creation potentially arising from investments in R&D, new product development, as well as infrastructure necessary to sustain the enterprise.
Restriction: Must be in Business and Management (Master's) program; or permission of BMGT-Robert H Smith School of Business.

BUSI784 Systems Design, Development, Test and Evaluation (2 Credits)
Systems engineering approaches to the definition, design, development, implementation, integration, verification, and validation of successful systems. Particular focus will be placed on the critical collaboration needed between business leaders and IT leaders in the early stages of program definition and how to effectively leverage and assess business-driven enterprise, product, and program development. The course will cover contemporary product lifecycle phases and the systems engineering technical processes associated with research and product development organizations in industry and government. It will explore currently popular development methodologies such as incremental, spiral, evolutionary, lean, and agile and how these are driven by concept and requirements development, systems analysis and modeling, and system architecting and are measured by technology prototyping, research validation, technology testing, and program/product evaluation. The intent is exposure to the systems engineering processes and product/program lifecycle is to help technology management professionals align developmental efforts to business/mission strategy; help them to oversee, collaborate with, and evaluate technology development efforts; and help them navigate challenges of technology development and adoption and advance technologies more efficiently from concept to operational use.
Restriction: Must be in Business and Management (Master's) program; or permission of BMGT-Robert H Smith School of Business.

BUSI785 Project Management in Dynamic Environments (2 Credits)
Addresses project management skills that are required by successful managers in increasingly competitive and faster-moving environments. Examines fundamental concepts of successful project management, and the technical and managerial issues, methods, and techniques.
Restriction: Must be in one of the following programs (Business and Management (Master's); Business and Management (Master's)) ; or permission of BMGT-Robert H. Smith School of Business.

BUSI786 Technology Management Capstone Action Learning Project (2 Credits)
This course will function as an experiential practicum to apply the skills and learning outcomes accumulated throughout the Technology Management curriculum toward solving real-world problems and cases. Projects will be chosen and executed in teams, and when possible sponsored by student employers or school partners. Project selection and maturation will receive iterative faculty facilitation.
Restriction: Must be in Business and Management (Master's) program; or permission of BMGT-Robert H Smith School of Business.

BUSI787 Integrative Capstone (2 Credits)
Provide students with an integrative experience to utilize the functional tools amassed in the MBA program and acquire new knowledge in the areas of international business, business ethics and executive/leadership presence, provide students with the opportunity to work with multiple functional areas at a time to drive business growth and utilize cases to address domestic and international challenges, enabling you to sharpen your skills in utilizing several methods for adding economic value when expanding globally. Additionally, students will raise awareness of best practices in building executive/leadership presence, as functional knowledge and business expertise is not enough to ensure successful career progression.
Restriction: Must be in Business and Management (Master's) program OR Permission of BMGT-Robert H. Smith School of Business.

BUSI788 Introduction to Global Business Experience (1-2 Credits)
Introduction to the economic climate of the country and region, history, political influences on business landscape, and specific opportunities and threats of doing business in the destination country. Course is a prerequisite to short-term study abroad classes.
Restriction: Must be in a major in BMGT-Robert H. Smith School of Business.
Repeatable to: 2 credits.

BUSI790 Healthcare Operations Management and Marketing (3 Credits)
Introduction to a variety of tools that have been used to minimize waste and create value in the healthcare sector. These tools can also be applied to organizations outside of the healthcare sector. This course will focus on two critical aspects marketing in the context of hospitals and other health delivery organizations: service quality and customer relationship management. This course provides insight into the critical strategic decisions that healthcare managers must make as they seek to improve the performance of their organizations and attract and retain customers.
Restriction: Must be in Business and Management (Master's) program; or permission of BMGT-Robert H. Smith School of Business.

BUSI791 Research and Development Strategy and Process (2 Credits)
This course will educate technology management professionals on contemporary strategy, management approaches, and best-practices for research and development. The course will focus on private sector methods to manage technology programs, identify and specify technical requirements, communicate technology use and value, and assess new technologies and architectures. It will include instruction on technology scouting and assessing Technology Readiness Levels (TRLs). Through engagement with experts in creating and managing technology, students will also be exposed to human and behavioral factors that can influence technology adoption in the commercial and public sector.
Restriction: Must be in Business and Management (Master's) program; or permission of BMGT-Robert H Smith School of Business.

BUSI792 Health Informatics and Information Technologies (3 Credits)
Targeted at professionals, managers, and consultants in healthcare to develop their understanding of core health informatics knowledge, IT concepts and management skills. Students will learn about policies, standards and methods of information exchange, data quality, cloud computing, behavior and population management, personal data collection devices, and how these elements can come together as parts of systems.
Restriction: Must be in Business and Management (Master's) program; or permission of BMGT-Robert H. Smith School of Business.

BUSI794 Current Topics in Healthcare Transformation (3 Credits)
Covers a range of topics selected to enhance students understanding of the current healthcare environment, strategic landscape, critical policy changes, and how to lead transformation in their organizations.
Restriction: Must be in Business and Management (Master's) program; or permission of BMGT-Robert H. Smith School of Business.

BUSI796 Health Economics and Financing (3 Credits)
Designed to provide managers and professionals with a comprehensive overview of topics related to the economics and financial aspects of healthcare. Students will gain a perspective of how the healthcare ecosystem works from an economics perspective. The knowledge will be helpful for better economic analysis and business management in healthcare.
Restriction: Must be in Business and Management (Master's) program; or permission of BMGT-Robert H. Smith School of Business.

BUSI798 Global Business Experience (2-4 Credits)
Provides MBA students the opportunity to combine classroom learning and project research with seminars in a host country. The focus and locations visited will vary.
Restriction: Must be in one of the following programs (Business and Management (Master's); Business and Management (Master's)) ; or permission of BMGT-Robert H. Smith School of Business.
Repeatable to: 6 credits if content differs.

BUSI799 Masters Thesis Research (1-6 Credits)

BUSM - Full-Time MBA Program

BUSM600 Leadership and Teamwork (2 Credits)
Course examines concepts of team-building and leadership which are critical to managerial success. Topics include leadership, decision making, communication and conflict, work motivation, building effective teams, and organizational change and culture.
Restriction: Must be in Business and Management (Master's) program; or permission of BMGT-Robert H. Smith School of Business.
Credit Only Granted for: BMGT600, BUSI662 or BUSM600.

BUSM602 Introduction to Financial Accounting (2 Credits)
Overview of financial accounting, periodic financial statements and the financial reporting process. Importance of financial statements as information source for creditors and investors and as a means by which managers can communicate information about their firms.
Restriction: Must be in Business and Management (Master's) program; or permission of BMGT-Robert H. Smith School of Business.
Credit Only Granted for: BUSI610 or BUSM602.

BUSM604 Managerial Economics and Public Policy (2 Credits)
Basic microeconomic principles used by firms, including supply and demand, elasticities, costs, productivity, pricing, market structure and competitive implications of alternative market structures. Market failures and government intervention. Public policy processes affecting business operations.
Restriction: Must be in Business and Management (Master's) program; or permission of BMGT-Robert H. Smith School of Business.
Credit Only Granted for: BUSI681 or BUSM604.

BUSM606 Data Driven Decision Making (2-3 Credits)
Analytical modeling of business decisions; uncertainty, risk and expected utility; regression modeling to infer relationships among variables.
Restriction: Must be in Business and Management (Master's) program; or permission of BMGT-Robert H. Smith School of Business.
Credit Only Granted for: BUSI630 or BUSM606.

BUSM610 Financial Management (2-3 Credits)
Focuses on the valuation of the real assets of firms as well as the valuation of stocks and bonds, the primary financial assets in an economy. While details vary, the conceptual foundations of valuation boil down to three themes: time value of money, no-arbitrage, and systematic risk.
Restriction: Must be in Business and Management (Master's) program; or permission of BMGT-Robert H. Smith School of Business.
Credit Only Granted for: BUSI640 or BUSM610.

BUSM612 Marketing Management (2 Credits)
Analysis of marketing problems and evaluation of specific marketing efforts regarding the organization's products and services, pricing activities, channel selection, and promotion strategies in both domestic and international markets.
Restriction: Must be in Business and Management (Master's) program; or permission of BMGT-Robert H. Smith School of Business.
Credit Only Granted for: BUSI650 or BUSM612.

BUSM614 Strategic Management (2 Credits)
Analyze and identify profit opportunities and threats in different industry and competitive environments; Analyze and identify a firm's valuable assets, resources and capabilities and how they might be protected, leveraged, and extended in the market; Learn how to organize your company to be the best prepared to adapt its strategy over time as the market environment changes; and how to use organic growth as well as mergers, acquisitions, joint ventures, alliances, and divestitures to ensure that the firm maintians the proper scale and scope to compete effectively over time.
Restriction: Must be in Business and Management (Master's) program; or permission of BMGT-Robert H. Smith School of Business.
Credit Only Granted for: BUSI690 or BUSM614.

BUSM616 Managerial Accounting (2 Credits)
Use of accounting data in corporate planning and control. Cost-volume-profit analysis, budgeting, pricing decisions and cost data, transfer pricing, activity-based management, performance measures, and standard costing.
Prerequisite: BUSI610.
Restriction: Must be in Business and Management (Master's) program; or permission of BMGT-Robert H. Smith School of Business.
Credit Only Granted for: BUSI611 or BUSM616.

BUSM621 Digital Transformation in Business (2 Credits)
Introduces students to the strategic role of digital transformation within businesses, and provides an overview for how major information technologies may be used to inform and transform the firm's strategic, operational, and tactical decisions. Topics discussed in the course include the strategic use of digital technologies to generate sustainable competitive value; the contributions of new forms of technology infrastructure; the evaluation of new technology investments and the resulting ROI; acquiring, managing and governing technological capabilities within the firm; understanding the role of enterprise systems and social technologies within the firm; and the management of disruptive technologies within and outside the firm.
Restriction: Must be in Business and Management (Master's) program; or permission of BMGT-Robert H. Smith School of Business.

BUSM622 Managing Digital Business Markets (2 Credits)
The objective is to understand the strategic and tactical issues involved in managing digital businesses and markets. Also, some of the characteristics of digital businesses and markets that make them unique and understand how companies can best manage them will be examined.
Restriction: Must be in Business and Management (Master's) program; or permission of BMGT-Robert H. Smith School of Business.
Credit Only Granted for: BUSI622 or BUSM622.

BUSM624 Operations Management (2 Credits)
Operations management is concerned with efficient and effective design and operation of business processes for delivering products and/or services. Emphasis is given to process analysis and design, capacity management and bottlenecks, waiting lines and the impact of uncertainty in process performance, quality management, lean, six-sigma, and revenue management.
Restriction: Must be in Business and Management (Master's) program; or permission of BMGT-Robert H. Smith School of Business.
Credit Only Granted for: BUSI634 or BUSM624.

BUSM626 The Global Economic Environment (2 Credits)
Relationship between national and international economic environments. Determinants of output, interest rates, prices and exchange rates. Analysis of effect of economic policies (fiscal, monetary, trade, tax) on the firm and the economy.
Restriction: Must be in Business and Management (Master's) program; or permission of BMGT-Robert H. Smith School of Business.
Credit Only Granted for: BUSI683 or BUSM626.

BUSM701 Marketing Research Methods (2 Credits)
The process of acquiring, classifying and interpreting primary and secondary marketing data needed for intelligent, profitable marketing decisions. Evaluation of the appropriateness of alternative methodologies, such as the inductive, deductive, survey, observational, and experimental. Recent developments in the systematic recording and use of internal and external data needed for marketing decisions.
Prerequisite: BUSM606; and BUSM612.
Restriction: Must be in Business and Management (Master's) program; or permission of BMGT-Robert H. Smith School of Business.
Credit Only Granted for: BUMK701 or BUSM701.
Formerly: BUMK701.

BUSM702 Consumer Behavior (2 Credits)
Analysis of customer decision-making and how marketing strategy can be used to influence those decisions. The framework is a buyer behavior model, in which concepts from psychology, sociology, and economics are applied to individual and organizational purchase decisions. Marketing strategies of leading firms in consumer products, technology, and services (including internet services) are analyzed using a variety of case study formats. Focus is consumer behavior; however, principles can also be applied to the decision-making of business.
Prerequisite: BUSM612.
Restriction: Must be in Business and Management (Master's) program; or permission of BMGT-Robert H. Smith School of Business.
Credit Only Granted for: BUMK715 or BUSM702.

BUSM703 Marketing Strategy (2 Credits)
A capstone marketing course. Marketing strategies designed to manage products in selected market segments. Topics covered include competitor analysis, buyer analysis, market segments, and product strengths and weaknesses; product related issues are identified and marketing strategies developed, assessed and implemented.
Prerequisite: BUSM612.
Restriction: Must be in Business and Management (Master's) program; or permission of BMGT-Robert H. Smith School of Business.
Credit Only Granted for: BUMK757 or BUSM703.

BUSM704 New Product Development (2 Credits)
This course focuses on the development of innovations, new products or new services from the perspective of a marketer. For an innovation to be successful in the market, it has to be customer centric: hence, in this course, we study how to develop and bring to market elegant and efficient solutions to strong customer needs. This is a fundamental business challenge, faced while working in a startup or in an established company; when developing a new product or a new service; and when serving customers who are individuals or large corporations.
Prerequisite: BUSM612.
Restriction: Must be in one of the following programs (Business and Management (Master's); Business and Management (Master's)) ; or permission of BMGT-Robert H. Smith School of Business.

BUSM705 Brand Management (2 Credits)
Brand names are valuable assets for firms. Effective brand management is critical to maintaining the long-term profitability of products and services. Topics include understanding brands from the customer's perspective, building brand equity, measuring brand equity, leveraging brand equity, managing brand portfolios and managing brands over time.
Prerequisite: BUSM612.
Restriction: Must be in Business and Management (Master's) program; or permission of BMGT-Robert H. Smith School of Business.
Credit Only Granted for: BUMK716 or BUSM705.

BUSM706 Innovation & Product Development (2 Credits)
Focuses on the development of innovations - new products or new services - from the perspective of a marketer. For an innovation to be successful in the market, it has to be customer-centric: hence, in this course, we study how to develop and bring to market elegant and efficient solutions to strong customer needs. This is a fundamental business challenge, faced while working in a startup or in an established company; when developing a new product or a new service; and when serving customers who are individuals or large corporations.
Restriction: Must be in Business and Management (Master's) program; or permission of BMGT-Robert H. Smith School of Business.
Credit Only Granted for: BUMO758P or BUSM706.

BUSM708 Independent Study in Business (1-6 Credits)
Independent study for Masters students in Business.
Restriction: Must be in Business and Management (Master's) program; or permission of BMGT-Robert H. Smith School of Business.
Repeatable to: 6 credits if content differs.

BUSM710 Advanced Marketing Analytics Models (2 Credits)
Introduction to modeling tools used to support marketing analysis and decision making. Applications in strategic marketing, marketing segmentation, new product development, sales promotion analysis, pricing, design of marketing mix, sales force allocation, and direct marketing. Spreadsheet driven cases and illustrative readings.
Prerequisite: BUSM612.
Restriction: Must be in Business and Management (Master's) program; or permission of BMGT-Robert H. Smith School of Business.
Credit Only Granted for: BUMK706 or BUSM705.

BUSM711 Pricing Strategies for Sustainable Competitive Advantage (2 Credits)
Pricing is one of the most important marketing decisions a firm faces. This course will help participants to develop pricing strategies using actual proven concepts, processes and techniques, to align pricing strategies with corporate goals and objectives, to determine the value customers assign to products and services using competitive pricing analysis, and to optimize pricing using customer segmenting strategies. The course will focus on both economic and behavioral aspects of pricing, and evaluation of innovative pricing practices such as price matching, customized pricing, bundle pricing and product line pricing, covering both B2B and B2C markets. Instruction will be through a mix of case studies, pricing simulation games, hands-on exercises and discussions. The course will provide participants with an in-depth understanding of state-of-the-art pricing strategies, practices and techniques for making profitable and sustainable pricing decisions.
Prerequisite: BUSM612.
Restriction: Must be in Business and Management (Master's) program; or permission of BMGT-Robert H. Smith School of Business.

BUSM713 Market Forecasting (2 Credits)
Students will learn a number of market forecasting methods, each appropriate for different contexts. The majority of this course focuses on quantitative modeling techniques based on established statistical methods. We also cover non-statistical methods that are often used when empirical data is scarce. This is a very hands-on class where students will apply the forecasting methods learned to real data.
Prerequisite: BUSM606 and BUSM612.
Restriction: Must be in Business and Management (Master's) program; or permission of BMGT-Robert H. Smith School of Business.

BUSM714 Integrated Marketing Communications (2 Credits)
Marketing communications are a complex but critical component of marketing strategy. Topics include communication tools: advertising, sales promotions, corporation communications, one-on-one or direct marketing, public relations, internet communications, sponsorship/events marketing, and marketing communcation plans: defining objectives, implementing the plan, and measuring communications effectiveness. Achieving integration in the content, look, and feel of all marketing communications is stressed.
Prerequisite: BUSM612.
Restriction: Must be in Business and Management (Master's) program; or permission of BMGT-Robert H. Smith School of Business.
Credit Only Granted for: BUMK717 or BUSM707.

BUSM715 Digital Marketing (2 Credits)
It has been a quarter century since the commercial use of the Internet and the World Wide Web began and during that time the business landscape has changed at a frenetic pace. Large multinational corporations such as Alphabet/Google, Facebook, Amazon, Alibaba and eBay, unheard of twenty years ago, have emerged as key players in our modern economy. In 2017 holiday season, online sales increased over 16 percent of overall spending online in 2016 with online retail spending in the U.S., the highest percentage since tracking began in 1999. Sales made through mobile devices have increased at a rapid rate to around 22 to 40 percent of all online sales. Corporations now highlight the importance of creating a digital relationship with customers. Moreover, digital technologies and devices such as smartphones, smart products, the Internet of Things, Artificial Intelligence, and deep learning all promise significant transformations of consumers lives in the near future. It is against this backdrop this course seeks to understand how the developments in digital technology are re-shaping the process and the strategy of marketing in the broad space we call digital marketing.
Restriction: Must be in Business and Management (Master's) program OR Permission of BMGT-Robert H. Smith School of Business.

BUSM716 Social Media and Internet Marketing (2 Credits)
Examines the process of developing, implementing, and analyzing strategies for successfully marketing a variety of existing and potential products and services using electronic media. Besides well-established Internet marketing tools such as e-mail, search engines and display advertising, a substantial part of the course is dedicated to understanding social media, analyzing successful social media strategies, and tracking their effectiveness. The course offers hands-on experience with many popular as well as emerging techniques unique to electronic media. Special attention is given to metrics appropriate for the new media.
Prerequisite: BUSM612.
Restriction: Must be in Business and Management (Master's) program; or permission of BMGT-Robert H. Smith School of Business.

BUSM731 Capital Markets (2 Credits)
Designed to deepen the foundations necessary to finance focused students, especially those intending to specialize in the quantitative areas of finance including investments, fixed income, and financial engineering.
Prerequisite: BUSM610.
Restriction: Must be in Business and Management (Master's) program; or permission of BMGT-Robert H. Smith School of Business.
Credit Only Granted for: BUFN740 or BUSM731.

BUSM733 Valuation in Corporate Finance (2 Credits)
An advanced topics course in Corporate Finance dealing with valuation. Main topics will be, building pro forma statements, cost of capital, using ratios and comparables to value projects and firms, dicounted cash flow valuations, WACC and APV methods of valuation and Real Option Valuations.
Prerequisite: BUSM610.
Restriction: Must be in Business and Management (Master's) program; or permission of BMGT-Robert H. Smith School of Business.
Credit Only Granted for: BUFN750 or BUSM733.

BUSM735 Financial Strategy for Corporations (2 Credits)
An advanced course in corporate finance, focusing on the issues that firms face when they plan to raise external capital from financial markets. The focus is on the financing problems faced by mid-market to large firms and on capital raised from public markets. The forms of external finance vary from simple debt or equity to more complex securities that bundle with an element of risk management.
Prerequisite: BUSM610.
Restriction: Must be in Business and Management (Master's) program; or permission of BMGT-Robert H. Smith School of Business.
Credit Only Granted for: BUFN751 or BUSM735.

BUSM736 Corporate Risk Management (2 Credits)
Surveys the theory and practice of financial risk identification, measurement, and mitigation at financial and non-financial firms. Topics will include hedging with options and futures, interest rate risk management, Value-at-Risk (VaR), Cashflow-at-Risk (CaR), Earnings-at-Risk (EaR), credit risk, equity risk, commodities risk, exchange rate risk, and lessons from risk management disasters.
Prerequisite: BUSM610.
Restriction: Must be in Business and Management (Master's) program; or permission of BMGT-Robert H. Smith School of Business.
Credit Only Granted for: BUFN754 or BUSM736.

BUSM737 Applied Equity Analysis (2 Credits)
Students will learn to analyze equity securities using the basic EIC (Economy/Industry/Company) framework used in the financial industry, paying special attention to financial statement analysis. Students also will learn the primary valuation techniques used to estimate market values for equity securities.
Prerequisite: BUSM610.
Restriction: Must be in Business and Management (Master's) program; or permission of BMGT-Robert H. Smith School of Business.
Credit Only Granted for: BUFN760 or BUSM737.

BUSM738 Investment Fund Management (1-4 Credits)
Provides second-year Master in Business Administration students with the opportunity to apply the skills learned in finance classes to actual investment decisions through management of an investment fund.
Prerequisite: BUSM610.
Restriction: Must be in Business and Management (Master's) program; and permission of BMGT-Robert H. Smith School of Business.
Repeatable to: 12 credits.
Credit Only Granted for: BUFN738 or BUSM738.

BUSM741 Financial Restructuring (2 Credits)
Focuses on identifying ways to increase firm value through corporate restructuring. Specific topics include: mergers and tender offers, spin-offs, carve-outs, divestitures, takeover defense strategies, leveraged buy-outs, and international acquisitions. Additionally, the theory, practice and empirical evidence related to each of these topics will be covered. Emphasis will be placed on valuation analysis and strategic considerations.
Prerequisite: BUSM610.
Restriction: Must be in Business and Management (Master's) program; or permission of BMGT-Robert H. Smith School of Business.
Credit Only Granted for: BUFN752 or BUSM741.

BUSM743 Entrepreneurial Finance and Private Equity (2 Credits)
An advanced topics course in Corporate Finance. The major emphasis is how financiers help growing firms - and in particular young start-ups - using different types of securities at different points in the industry's and firm's life. Financing arrangements and securities studied will include private equity funds and private financings placements, Venture Capital (VC) and preferred equity, Investment Banks through Initial Public Offerings (IPOs), Private equity finds, debt and leveraged buyouts. Students will learn additional techniques that will help them understand how financiers value firms and how to understand, plan and value different financing strategies.
Prerequisite: BUSM610.
Restriction: Must be in Business and Management (Master's) program; or permission of BMGT-Robert H. Smith School of Business.
Credit Only Granted for: BUFN755 or BUSM743.

BUSM744 Portfolio Management (2 Credits)
Provides training that is important in understanding the investment process - the buy side of the financial world. Specifically, the objective is to provide graduate-level instruction in the following topics, both in theory and in using financial markets data to test the basic theory and practice of portfolio choice and equilibrium pricing models and their implications for efficient portfolios.
Prerequisite: BUSM610; and BUSM731.
Restriction: Must be in Business and Management (Master's) program; or permission of BMGT-Robert H. Smith School of Business.
Credit Only Granted for: BUFN763 or BUSM744.

BUSM745 Derivative Securities (2 Credits)
Standard types of derivatives contracts are presented, and illustrated as to how they are used in practice. The theory of pricing these contracts is then presented in detail. The use of static and dynamic replication strategies, and the concept of no-arbitrage strategies is illustrated in numerous ways. Standard valuation techniques are covered, and standard formulas are presented. The theory is then applied to develop specific pricing and hedging strategies for various types of derivatives on different underlying assets. The management of the exposure of various risks is covered in detail as well.
Prerequisite: BUSM610.
Restriction: Must be in Business and Management (Master's) program OR Permission of BMGT-Robert H. Smith School of Business.

BUSM747 Financial Reporting & Analysis (2 Credits)
Uses authoritative professional pronouncements to examine advanced financial reporting issues. Examines complex problems in accounting and reporting; examples include pensions, taxes, interest rate swaps, derivative securities, international transactions, and international financial reporting. Takes a user-oriented perspective, and examines the ways in which financial accounting information is used by investors, analysts, and creditors. Examples include if users adjust for alternative accounting methods or for information that is recognized versus disclosed.
Prerequisite: BUSM602.
Restriction: Must be in Business and Management (Master's) program; or permission of BMGT-Robert H. Smith School of Business.

BUSM750 Project Management in Dynamic Environments (2 Credits)
Addresses project management skills that are required by successful managers in increasingly competitive and faster-moving environments. Examines fundamental concepts of successful project management, and the technical and managerial issues, methods, and techniques.
Restriction: Must be in Business and Management (Master's) program; or permission of BMGT-Robert H. Smith School of Business.
Credit Only Granted for: BUSI785 or BUSM750.

BUSM751 Managing Supply Chains: Models & Analysis (2 Credits)
Focuses on the strategic aspects of operations and supply chain management. Uses a framework for developing an operations strategy, and identify and analyze the key operations decisions which can have a major impact on a company's competitive position.
Prerequisite: BUSM606 and BUSM624.
Restriction: Must be in Business and Management (Master's) program OR Permission of BMGT-Robert H. Smith School of Business.

BUSM752 Games of Strategy and Incentives (4 Credits)
Analysis of managerial decisions in strategic environments using tools from game theory; competition and cooperation in product markets; principal-agent model and the economics of incentives; analytical foundations of behavioral constructs such as reputation, commitment and credibility.
Prerequisite: Permission of BMGT-Robert H. Smith School of Business. Or BUSM610; and BUSM604; and BUSM614.
Restriction: Must be in Business and Management (Master's) program; or permission of BMGT-Robert H. Smith School of Business.

BUSM754 Competitive and Collaborative Negotiation (2 Credits)
Increase negotiating self-confidence and improve capacity to achieve win-win solutions to organizational problems. Improve effectiveness at finding creative solutions to conflict.
Restriction: Must be in Business and Management (Master's) program; or permission of BMGT-Robert H. Smith School of Business.
Credit Only Granted for: BUMO714 or BUSM754.

BUSM755 Organizational Change (2 Credits)
Develops the advanced knowledge and skills of MBA students who plan to work with organizations as change agents. Concrete and useful strategies, tools, and interventions for diagnosing organizational change situations, analyzing problems, and designing and implementing organizational change. Draws on literature from organizational behavior, human resource management and strategic management to identify models as prescriptions of change.
Prerequisite: BUSM600.
Restriction: Must be in Business and Management (Master's) program; or permission of BMGT-Robert H. Smith School of Business.

BUSM757 Implementing Strategy: Organizing to Compete (2 Credits)
Organizational dynamics of competitive advantage. Impact of alternative organizational structures, planning and control systems, human resource management practices, and executive leadership styles on the implementation of archetypically different strategies.
Prerequisite: BUSM614.
Restriction: Must be in Business and Management (Master's) program; or permission of BMGT-Robert H. Smith School of Business.
Credit Only Granted for: BUMO751 or BUSM757.

BUSM758 Special Topics in Business (1-4 Credits)
Selected advanced topics in the various fields of graduate study in business.
Prerequisite: Permission of BMGT-Robert H. Smith School of Business.
Restriction: Must be in Business and Management (Master's) program; or permission of BMGT-Robert H. Smith School of Business.
Repeatable to: 9 credits if content differs.
Formerly: BMGT798.

BUSM761 Data Mining and Predictive Analytics (2 Credits)
Data mining techniques and their use in business decision making. A hands-on course that provides an understanding of the key methods of data visualization, exploration, classification, prediction, time series forecasting, and clustering.
Prerequisite: BUSM606.
Restriction: Must be in Business and Management (Master's) program; or permission of BMGT-Robert H. Smith School of Business.
Credit Only Granted for: BUDT733 or BUSM761.
Formerly: BUDT733.

BUSM762 Decision Analytics (2 Credits)
Analytical modeling for managerial decisions using a spreadsheet environment. Includes linear and nonlinear optimization models, decision making under uncertainty and simulation models.
Prerequisite: BUSM606.
Restriction: Must be in Business and Management (Master's) program; or permission of BMGT-Robert H. Smith School of Business.
Credit Only Granted for: BUDT732 or BUSM762.

BUSM764 Pricing and Revenue Management (2 Credits)
Specialized course on pricing and revenue management (PRM) that provide students with tools and principles, drawn from several disciplines (Operations, Microeconomics, Decision Modeling, Statistics, Marketing, IS) to make effective pricing decisions. Topics covered include economics of pricing, strategy and tactics of PRM, pricing optimization, differentiated pricing, dynamic pricing, mark-down pricing, legal and ethical issues in models/methods used in making effective PRM decisions and managerial or organizational factors that hold the key to success in execution of PRM.
Prerequisite: BUSM606; and BUSM624.
Restriction: Must be in Business and Management (Master's) program; or permission of BMGT-Robert H. Smith School of Business.
Credit Only Granted for: BUDT775 or BUSM764.

BUSM765 Social Media and Web 2.0 (2 Credits)
Over the past years, social computing technologies such as online communities, blogs, wikis, and social networking systems have become important tools for individuals to seek information, socialize with others, get support, collaborate on work, and express themselves. Increasingly, businesses are trying to leverage web 2.0 by using social computing technologies to communicate with customers, employees, and other business partners or to build new business models. This course will review concepts and principles related to web 2.0 and examine issues and strategies associated with business use of social computing technologies.
Prerequisite: BUSM621; or BUSM622.
Restriction: Must be in Business and Management (Master's) program; or permission of BMGT-Robert H. Smith School of Business.
Credit Only Granted for: BUDT706 or BUSM765.

BUSM767 Process Improvement (2 Credits)
Provide you with the necessary knowledge, tools and real-world examples to improve any organizational process and help students understand how a supply chain works from the perspective of processes improvement using Lean and, Six Sigma methods. Much of the focus will be on identifying where improvement opportunities reside, understanding and improving the flow of supply chain processes, and eliminating non-value activities using a wide arrange of tools.
Restriction: Must be in Business and Management (Master's) program OR Permission of BMGT-Robert H. Smith School of Business.

BUSM771 Leading Strategically (2 Credits)
Focus on the aspects of the firm that facilitate reaching strategic objectives. The firm is comprised of formal structures or architecture, routines and practices, and culture and norms that all need to be well-aligned to support your strategy. In particular, organizational alignment facilitates the development of innovative ideas, achieving operational efficiency, sustaining organizational growth, adopting new business models, achieving strategic change, and building organizational competence. Students will use several tools to assist in analysis, such as congruence analysis, the 7S model, network analysis, and design thinking. Focus on thinking systematically and analytically about managing an organization and leading strategically.
Restriction: Must be in Business and Management (Master's) program OR Permission of BMGT-Robert H. Smith School of Business.

BUSM773 Innovation & Entrepreneurship (2 Credits)
Provides an introduction to important tools and skills necessary to create and grow a successful new venture. Integrates research findings from a range of different practical and intellectual perspectives, including psychology, sociology, economics, strategic management, and history into practical, hands on lessons for an entrepreneur. Class projects provide the foundations for new, real businesses.
Restriction: Must be in Business and Management (Master's) program; or permission of BMGT-Robert H. Smith School of Business.
Credit Only Granted for: BUMO732 or BUSM773.

BUSM775 Global Strategy (2 Credits)
Focuses on the "strategic" and "organizational" questions that a company must address as it globalizes its footprint. Among the questions that will be addressed are: What are the potential benefits, costs, and risks associated with going abroad? What differentiates a "global" from a "multidomestic" industry? What are the sources of competitive advantage in a global context?
Restriction: Must be in Business and Management (Master's) program; or permission of BMGT-Robert H. Smith School of Business.
Credit Only Granted for: BUMO754 or BUSM775.

BUSM778 Introduction to Global Business Experience (1-4 Credits)
Introduction to the economic climate of the country and region, history political influences on business landscape, and specific opportunities and threats of doing business in the destination country. Course is a prerequisite to short-term study abroad classes.
Restriction: Must be in Business and Management (Master's) program; or permission of BMGT-Robert H. Smith School of Business.
Repeatable to: 4 credits.
Credit Only Granted for: BUSI788 or BUSM778.

BUSM781 International Economics for Managers (2 Credits)
Focus on understanding critical aspects of international economics that influence firm decisions and behavior. While covering theoretic fundamentals of international trade and foreign direct investment, focus on the implications for managers from these international economic activities. Such forces of globalization create winners and losers, and consider how firms can take advantage of these asymmetries. The topical issues include: - international trade: trade theory, comparative advantage, production location, why and how government is involved in international trade, how government involvement affects trade - firms participating abroad: determinants of foreign direct investment, location choice, off-shoring, emerging multinationals, emerging markets.
Restriction: Must be in Business and Management (Master's) program OR Permission of BMGT-Robert H. Smith School of Business.

BUSM783 Global Supply Chain Management (2 Credits)
Offers a practical blueprint for understanding, building, implementing, and sustaining supply chains in today's rapidly changing global supply chain environment. It will provide the student with a survey of the fast-moving Supply Chain Management discipline and practice, including the evolution of supply chain strategies, business models and technologies; current best practices in demand and supply management; and methodologies for conducting supply chain-wide diagnostic assessments and formulating process improvement plans.
Restriction: Must be in Business and Management (Master's) program; or permission of BMGT-Robert H. Smith School of Business.
Credit Only Granted for: BUSI672 or BUSM783.

BUSM784 Assessing and Managing Supply Chain Risks (2 Credits)
Supply chain managers are facing an increasingly volatile operating environment, with constant danger of trading community disruption from business, social and environmental risks. Students are provided with a working knowledge of both the core techniques of supply chain risk assessment and mitigation; as well as best practices in establishing formal corporate supply chain risk management programs. A semester-long X-Treme Supply Chain Simulation will enable students to gain hands-on experience in navigating a computer company through a complex and risky four quarters of global business operations.
Restriction: Must be in Business and Management (Master's) program; or permission of BMGT-Robert H. Smith School of Business.
Credit Only Granted for: BULM734 or BUSM784.

BUSM785 Global Supply Chain Resources Planning (2 Credits)
Provides students with an overall understanding of how firms use an advanced supply chain planning (ASCP) application as an integral part of their materials management process which includes such activities as production planning, materials requirements planning, and distribution requirements planning.
Restriction: Must be in Business and Management (Master's) program; or permission of BMGT-Robert H. Smith School of Business.
Credit Only Granted for: BULM742 or BUSM785.

BUSM786 Global Trade Logistics (2 Credits)
Acquaints students with managerial issues in international logistics and transportation, and provides students with an understanding of issues related to import/export management and the global marketplace.
Restriction: Must be in Business and Management (Master's) program OR Permission of BMGT-Robert H. Smith School of Business.

BUSM787 Supply Chain Management Experience (2 Credits)
Gain a hands-on experience with logistics and supply chain operations. Various supply chain management activities, ranging from transportation to warehousing, will be witnessed directly through a series of site visits and facility tours and explored in depth through directed company projects. Other supply chain management activities, such as purchasing and planning, will also be introduced throughout the semester.
Restriction: Must be in Business and Management (Master's) program OR Permission of BMGT-Robert H. Smith School of Business.

BUSM788 Global Business Experience (1-6 Credits)
Provides MBA students the opportunity to combine classroom learning and project research with seminars in a host country. The focus and locations visited will vary.
Restriction: Must be in Business and Management (Master's) program; or permission of BMGT-Robert H. Smith School of Business.
Repeatable to: 8 credits if content differs.

BUSM798 Business Consulting (1-4 Credits)
Selected advanced topics in the various fields of graduate study in business.
Restriction: Must be in Business and Management (Master's) program; or permission of BMGT-Robert H. Smith School of Business.
Repeatable to: 8 credits if content differs.
Credit Only Granted for: BUSM798 or BMGT798.

BUSO - Online MBA Programs

BUSO600 Leadership and Teamwork (2 Credits)
Course examines concepts of team-building and leadership which are critical to managerial success. Topics include leadership, decision making, communication and conflict, work motivation, building effective teams, and organizational change and culture.
Restriction: Must be in Business and Management (Master's) program; or permission of BMGT-Robert H. Smith School of Business.
Credit Only Granted for: BUSI662, BUSO600 or EMBA656.

BUSO601 Corporate Finance I (2 Credits)
Introductory course in corporate financial management. The course outlines the financial concepts and techniques used to evaluate corporate decisions. The topics include the time value of money, valuation of common securities, capital budgeting methods, and discounted cash flow. The objectives are to introduce the language and structure of finance and to develop the ability to analyze financial decisions.
Prerequisite: BUSO602.
Restriction: Must be in Business and Management (Master's) program; or permission of BMGT-Robert H. Smith School of Business.

BUSO602 Financial Accounting (2 Credits)
Overview of financial accounting, periodic financial statements and the financial reporting process. Importance of financial statements as information source for creditors and investors and as a means by which managers can communicate information about their firms.
Restriction: Must be in Business and Management (Master's) program; or permission of BMGT-Robert H. Smith School of Business.
Credit Only Granted for: EMBA610 or BUSO602.

BUSO603 Data Analysis (2 Credits)
Many different skills are required in arriving at informed managerial decisions. Among these are analytical and quantitative skills. Data Analysis is one in a sequence of two courses that seeks to develop these two important skills. More formally, the goals of this course are: to introduce basic statistical techniques: summarizing and presenting data; confidence intervals and hypothesis tests; regression analysis.; to implement these techniques using spreadsheets; and to become active users of data analysis in making managerial decisions.
Restriction: Must be in Business and Management (Master's) program; or permission of BMGT-Robert H. Smith School of Business.

BUSO604 Managerial Economics and Public Policy (2 Credits)
Basic microeconomic principles used by firms, including supply and demand, elasticities, costs, productivity, pricing, market structure and competitive implications of alternative market structures. Market failures and government intervention. Public policy processes affecting business operations.
Restriction: Must be in Business and Management (Master's) program; or permission of BMGT-Robert H. Smith School of Business.
Credit Only Granted for: EMBA681 or BUSO604.

BUSO612 Marketing Management (2 Credits)
Analysis of marketing problems and evaluation of specific marketing efforts regarding the organization's products and services, pricing activities, channel selection, and promotion strategies in both domestic and international markets.
Restriction: Must be in Business and Management (Master's) program; or permission of BMGT-Robert H. Smith School of Business.
Credit Only Granted for: EMBA757 or BUSO612.

BUSO614 Strategic Management (2 Credits)
Analyze and identify profit opportunities and threats in different industry and competitive environments; Analyze and identify a firm's valuable assets, resources and capabilities and how they might be protected, leveraged, and extended in the market; Learn how to organize your company to be the best prepared to adapt its strategy over time as the market environment changes; and how to use organic growth as well as mergers, acquisitions, joint ventures, alliances, and divestitures to ensure that the firm maintians the proper scale and scope to compete effectively over time.
Restriction: Must be in Business and Management (Master's) program; or permission of BMGT-Robert H. Smith School of Business.
Credit Only Granted for: BUSI690, BUSM614 or BUSO614.

BUSO616 Managerial Accounting (2 Credits)
Use of accounting data in corporate planning and control. Cost-volume-profit analysis, budgeting, pricing decisions and cost data, transfer pricing, activity-based management, performance measures, and standard costing.
Prerequisite: BUSI610; or BUSO602; or BUSM602.
Restriction: Must be in Business and Management (Master's) program; or permission of BMGT-Robert H. Smith School of Business.
Credit Only Granted for: BUSI611, BUSM616 or BUSO616.

BUSO620 Strategic Information Systems (2 Credits)
Use of information technology to achieve competitive advantage, efficient operations, and effective decision making. Analysis of functions of information technology and its impact on competitive strategy and organizational operations.
Restriction: Must be in Business and Management (Master's) program; or permission of BMGT-Robert H. Smith School of Business.
Credit Only Granted for: BUSO620, BUSI621, BUSM621 or EMBA620.

BUSO624 Operations Management (2 Credits)
Operations management is concerned with efficient and effective design and operation of business processes for delivering products and/or services. Emphasis is given to process analysis and design, capacity management and bottlenecks, waiting lines and the impact of uncertainty in process performance, quality management, lean, six-sigma, and revenue management.
Restriction: Must be in Business and Management (Master's) program; or permission of BMGT-Robert H. Smith School of Business.
Credit Only Granted for: BUSI634, BUSM624 or BUSO624.

BUSO626 The Global Economic Environment (2 Credits)
Relationship between national and international economic environments. Determinants of output, interest rates, prices and exchange rates. Analysis of effect of economic policies (fiscal, monetary, trade, tax) on the firm and the economy.
Restriction: Must be in Business and Management (Master's) program; or permission of BMGT-Robert H. Smith School of Business.
Credit Only Granted for: BUSI683, BUSM626 or BUSO626.

BUSO700 Fundamentals of Business (2 Credits)
This course introduces students to the language of business. Topics covered include financial accounting, financial management, data models, strategy, leadership and teamwork, and a brief action learning project on innovation. Pre-work includes the DISC assessment, and a requires a passing grade on a spreadsheet pre-work course.
Restriction: Must be in Business and Management (Master's) program; or permission of BMGT-Robert H Smith School of Business.

BUSO701 Integrative Business Capstone (2 Credits)
This is an experiential course that involves an integrative business experience. This experience may be simulated through a software package or through content, speakers and events that are based in a realistic business setting. Students compete in teams. Each team makes decisions in areas such as human resources, compensation packages, geographic expansion through sales offices, debt versus equity financing, manufacturing and inventory management, marketing, including pricing, advertising and product design. The impact of each of these decisions flows through the three financial statements and results in financial outcomes and ratios that measure the success of each team. Additional metrics include stakeholders beyond investors such as employee morale, community engagement, and environmental impact. Students compete for financing and for customers. Multiple presentations are made by students during the simulation to explain their strategy, their tactics, and their planned investments.
Prerequisite: Students must have completed a minimum of 48 credit hours.
Restriction: Must be in Business and Management (Master's) program; or permission of BMGT-Robert H. Smith School of Business.

BUSO702 Action Learning Project I (1 Credit)
The objective of the Action Learning Project I and II is for teams to identify and solve business problems that currently exist in organizations and in the process, to provide significant value to organizations and their stakeholders. The experience of solving business problems will both enable students to apply knowledge learned in core courses and to develop the wisdom, skills, and problem-solving capabilities of team members. This course is designed to promote independent learning. Faculty members will offer mini-modules on key themes such as team dynamics, client relations and consulting protocols but their primary role will be to facilitate the ALP process and serve as consultants to the student teams.Selecting the right project and defining it unambiguously sets the stage for the rest of the ALP process improvement or problem solving effort, ultimately leading to a relevant, value added and well-received deliverable. Poor problem selection creates longer-term problems for both ALP teams and the sponsoring organization and can reduce or impede the quality of your learning experience. For this reason, we will lay the foundation for the final selection of projects during this term (a) soliciting ideas from all students, and (b) offering feedback to identify and nurture the most promising ideas.
Restriction: Must be in Business and Management (Master's) program; or permission of BMGT-Robert H. Smith School of Business.

BUSO703 Action Learning Project II (3 Credits)
The objective of the Action Learning Project I and II is for teams to identify and solve/dissolve business problems that currently exist in organizations and inthe process, to provide significant value to organizations and their stakeholders. The experience of solving/dissolving business problems will both enablestudents to apply knowledge learned in core courses and to develop the wisdom, skills, and problem-solving capabilities of team members. This course isdesigned to promote independent learning. Faculty members will offer mini-modules on key themes such as organizational support, team dynamics and peerfeedback, but their primary role will be to facilitate the ALP process and serve as consultants to the student teams.
Prerequisite: BUSO702.
Restriction: Must be in Business and Management (Master's) program; or permission of BMGT-Robert H. Smith School of Business.

BUSO704 Ethical Leadership (2 Credits)
This course will examine business ethics issues across a variety of business contexts. You will learn toapply a number of ethical theories to business problems, primarily through case studies and discussion.The goal is for you to engage actively with the material and understand the complexity of many ethical dilemmas that businesses and business owners face. Often in ethics there is not one right answer; rather,businesses and individuals must wrestle with ethical principles that may compete and conflict with one another in arriving at a resolution. We will explore conflicts between personal values and organizationalgoals, ethics as part of a business strategy, and various ethical frameworks businesses may use in understanding and implementing ethical approaches to problems.
Restriction: Must be in Business and Management (Master's) program; or permission of BMGT-Robert H. Smith School of Business.
Credit Only Granted for: EMBA678 or BUSO704.

BUSO705 Business Communications (2 Credits)
Develop the ability to communicate with and about data.
Restriction: Permission of BMGT-Robert H. Smith School of Business; or must be in Business and Management (Master's) program.

BUSO706 Organizational Change (2 Credits)
Develops the advanced knowledge and skills of MBA students who plan to work with organizations as change agents. Concrete and useful strategies, tools, and interventions for diagnosing organizational change situations, analyzing problems, and designing and implementing organizational change. Draws on literature from organizational behavior, human resource management and strategic management to identify models as prescriptions of change.
Prerequisite: BUSM600; or BUSO600; or BUSI662; or EMBA656.
Restriction: Must be in Business and Management (Master's) program; or permission of BMGT-Robert H. Smith School of Business.
Credit Only Granted for: BUSO706 or BUSM755.

BUSO711 Executive Powers and Negotiation (2 Credits)
Increase negotiating self-confidence and improve capacity to achieve win-win solutions to organizational problems. Improve effectiveness at finding creative solutions to conflict.
Restriction: Must be in Business and Management (Master's) program; or permission of BMGT-Robert H. Smith School of Business.
Credit Only Granted for: BUMO714, BUSM754 or BUSO711.

BUSO712 Entrepreneurship (2 Credits)
Introduces students to tools and skills needed to create and grow a successful new venture. The course integrates research findings from a range of different practical and intellectual perspectives, including psychology, sociology, economics, strategic management, and history into practical, hands on lessons for an entrepreneur. Class projects teach skills to explore high-risk business ideas in inexpensive ways and allow students to experience the entrepreneurial environment.A startup is an organization formed to search for a repeatable and scalable business model (Steve Blank). Entrepreneurship is about pursuing hunches about solutions to customer problems and thereby creating value. Testing these hunches requires getting customers to evaluate solutions. It is difficult to attract resources (either human or financial) before it is known if the hunch is correct, but testing hunches requires resources. This course provides iterative tools to solve this chicken and egg problem. We will also focus on specific skill building exercises, such as pitching and networking.
Restriction: Must be in Business and Management (Master's) program; or permission of BMGT-Robert H. Smith School of Business.

BUSO713 Supply Chain Management (2 Credits)
Offers a practical blueprint for understanding, building, implementing, and sustaining supply chains in today's rapidly changing global supply chain environment. It will provide the student with a survey of the fast-moving Supply Chain Management discipline and practice, including the evolution of supply chain strategies, business models and technologies; current best practices in demand and supply management; and methodologies for conducting supply chain-wide diagnostic assessments and formulating process improvement plans.
Restriction: Must be in Business and Management (Master's) program; or permission of BMGT-Robert H. Smith School of Business.
Credit Only Granted for: BUSI672, BULM720 or BUSO713.

BUSO714 International Business (2 Credits)
The international business environment as it affects company policy and procedures. In-depth analysis and comprehensive case studies of the business functions undertaken in international operations.
Restriction: Must be in Business and Management (Master's) program; or permission of BMGT-Robert H. Smith School of Business.
Credit Only Granted for: BMGT794, BUSI761 or BUSO714.

BUSO716 Decision Modeling (2 Credits)
Many different skills are required in arriving at informed managerial decisions. Among these are analytical and quantitative skills. Decision Modeling is one in a sequence of two courses that seeks to develop these two important skills. More formally, the goals of this course are: to introduce business optimization modeling techniques to aid in complex decision making environments, decision trees to structure strategic decision making problems in an uncertain environment, and Monte-Carlo simulation to help analyze and assess the risk associated with decisions in an uncertain environment. We will demonstrate the use of all techniques in this course in a spreadsheet environment.
Restriction: Must be in Business and Management (Master's) program; or permission of BMGT-Robert H. Smith School of Business.

BUSO731 Social Media and Web Analytics (2 Credits)
Examines the process of developing, implementing, and analyzing strategies for successfully marketing a variety of existing and potential products and services using electronic media. Besides well-established Internet marketing tools such as e-mail, search engines and display advertising, a substantial part of the course is dedicated to understanding social media, analyzing successful social media strategies, and tracking their effectiveness. The course offers hands-on experience with many popular as well as emerging techniques unique to electronic media. Special attention is given to metrics appropriate for the new media.
Prerequisite: BUSM612; or BUSO612; or BUSI650.
Restriction: Must be in Business and Management (Master's) program; or permission of BMGT-Robert H. Smith School of Business.
Credit Only Granted for: BUMK758O, BUSO731 or BUSM716.

BUSO732 Managing Digital Business Markets and Platforms (2 Credits)
The objective is to understand the strategic and tactical issues involved in managing digital businesses and markets. Also, some of the characteristics of digital businesses and markets that make them unique and understand how companies can best manage them will be examined.
Restriction: Must be in Business and Management (Master's) program; or permission of BMGT-Robert H. Smith School of Business.
Credit Only Granted for: BUSI622, BUSM622 or BUSO732.

BUSO733 Data Mining and Predictive Analytics (2 Credits)
Data mining techniques and their use in business decision making. A hands-on course that provides an understanding of the key methods of data visualization, exploration, classification, prediction, time series forecasting, and clustering.
Prerequisite: BUSM606; or BUSO607; or BUSI630.
Restriction: Must be in Business and Management (Master's) program; or permission of BMGT-Robert H. Smith School of Business.
Credit Only Granted for: BUDT733, BUSM761 or BUSO733.

BUSO736 Systems and Design Thinking (2 Credits)
Examines the application of systems and design thinking strategy and methods to create pragmatic yet innovative solutions in the form of products and services for wicked problems. Through interactive idealized design; problem dissolution methods; non-linear thinking tools, out-of-the-box-thinking, design prototyping, and strategic exploration tools, students will explore, experience, and embrace design as means to new value creation. This course will highlight the importance of adopting a multidisciplinary and collaborative perspective, one that recognizes a balance between efficiency, and effectiveness; planning and action; risks and rewards; necessity and utility; and between short-term and long-term implications.
Restriction: Must be admitted to the appropriate graduate business program; or permission of the Masters Programs Office at the Robert H. Smith School of Business.

BUSO740 Customer Lifetime Valuation (2 Credits)
This course focuses on managing customers of a business, whether in B2B or B2C space, as a portfolio of equity. It provides an understanding of the current and future value of customers to the business. Topics include selective acquisition, development, and retention of customers using latest developments in information technology.
Prerequisite: BUSI650; or BUSM612; or BUSO612.
Restriction: Must be admitted to the appropriate graduate business program; or permission of the Masters Programs Office at the Robert H. Smith School of Business.

BUSO741 Consumer Behavior (2 Credits)
Analysis of customer decision-making and how marketing strategy can be used to influence those decisions. The framework is a buyer behavior model, in which concepts from psychology, sociology, and economics are applied to individual and organizational purchase decisions. Marketing strategies of leading firms in consumer products, technology, and services (including internet services) are analyzed using a variety of case study formats. Focus is consumer behavior; however, principles can also be applied to the decision-making of business.
Prerequisite: BUSM612; or BUSO612; or BUSI650.
Restriction: Must be in Business and Management (Master's) program; or permission of BMGT-Robert H. Smith School of Business.
Credit Only Granted for: BUMK715, BUSM702 or BUSO741.

BUSO744 Marketing Research Methods (2 Credits)
The process of acquiring, classifying and interpreting primary and secondary marketing data needed for intelligent, profitable marketing decisions. Evaluation of the appropriateness of alternative methodologies, such as the inductive, deductive, survey, observational, and experimental. Recent developments in the systematic recording and use of internal and external data needed for marketing decisions.
Prerequisite: BUSO603 and BUSO612.
Restriction: Must be admitted to the appropriate graduate business program; or permission of the Masters Programs Office at the Robert H. Smith School of Business.

BUSO747 Managing Brands and Products (2 Credits)
Brands are organizations' most valuable assets. Effective brand management is critical to maintaining the long-term profitability of organizations, and involves designing and implementing marketing programs to build, measure, and manage brand equity. This course will focus on exploring the fundamentals of branding and brand management from both the customer's and manager's perspectives. This course will cover why brands are important, what they represent to consumers, and what firms should do to manage them properly.
Restriction: Must be admitted to the appropriate graduate business program; or permission of the Masters Programs Office at the Robert H. Smith School of Business.

BUSO750 Global Trade Logistics (2 Credits)
Acquaints students with managerial issues in international logistics and transportation, and provides students with an understanding of issues related to import/export management and the global marketplace.
Restriction: Must be in one of the following programs (Business and Management (Master's); Business and Management (Master's)) ; or permission of BMGT-Robert H. Smith School of Business.
Credit Only Granted for: BMGT773, BULM733 or BUSO750.

BUSO751 Supply Chain Risk Management (2 Credits)
Supply chain managers are facing an increasingly volatile operating environment, with constant danger of trading community disruption from business, social and environmental risks. Students are provided with a working knowledge of both the core techniques of supply chain risk assessment and mitigation; as well as best practices in establishing formal corporate supply chain risk management programs. A semester-long X-Treme Supply Chain Simulation will enable students to gain hands-on experience in navigating a computer company through a complex and risky four quarters of global business operations.
Restriction: Must be in Business and Management (Master's) program; or permission of BMGT-Robert H. Smith School of Business.
Credit Only Granted for: BULM734, BUSM784 or BUSO751.

BUSO752 Innovative Solutions to Supply Chain Challenges (2 Credits)
This course is designed to provide you with practical challenges to implement innovative and effective actions to achieve the goalof enhanced supply chain operations. You will be challenged to function as a supply chain executive in charge of major decisions.The course is designed to be a mix of action-focused learning combined with some very recent and interesting examples of howcompanies are addressing their own supply chain challenges in innovative ways.
Restriction: Must be in Business and Management (Master's) program; or permission of BMGT-Robert H. Smith School of Business.

BUSO758 Special Topics in Business (1-4 Credits)
Selected advanced topics in the various fields of graduate study in business.
Prerequisite: Permission of BMGT-Robert H. Smith School of Business.
Restriction: Must be in Business and Management (Master's) program; or permission of BMGT-Robert H. Smith School of Business.
Repeatable to: 9 credits if content differs.

BUSO759 Independent Study in Business (1-4 Credits)
Independent study for Masters students in Business.
Restriction: Must be in Business and Management (Master's) program; or permission of BMGT-Robert H. Smith School of Business.
Repeatable to: 9 credits if content differs.
Credit Only Granted for: BUSO759 or BUSI759.

BUSO763 Business Law for Managers (2 Credits)
Provides an introduction to the legal process and the substantive law that shapes the legal environment of business. This course is designed to help students understand how law affects business operations, enabling them to identify and critically analyze legal issues that arise in a business context. Through a comprehensive study, students will gain insights into the impact of legal decisions and appreciate the importance of legal risk management in business. The curriculum covers essential topics such as the nature of law, legal civil procedure, constitutional law, torts, contracts, and intellectual property/AI law. Additionally, students will explore management of for-profit C corporations and basics of securities regulation, equipping them with the knowledge to navigate the complex legal landscape in managerial roles.
Restriction: Must be admitted to the appropriate graduate business program; or permission of the Masters Programs Office at the Robert H. Smith School of Business.

BUSO778 Global Business Experience (1-6 Credits)
Provides MBA students the opportunity to combine classroom learning and project research with seminars in a host country. The focus and locations visited will vary.
Restriction: Must be in Business and Management (Master's) program; or permission of BMGT-Robert H. Smith School of Business.
Repeatable to: 8 credits if content differs.

BUSO780 Fraud Examination, Detection, and Deterrence in the Business Environment (2 Credits)
The world is full of fraud schemes, victims, schemers, and those who catch them. Business, the public sector, and non-profitshave their bottom lines impacted every day by fraud. This class is about all of this, and is an introduction to fraud in theoperational environment. The primary objective of this course is for students to gain a conceptual understanding of how fraudoccurs, how it can be prevented, and how fraud can be detected through practical application of skills and tools. We will alsobriefly practice the skills needed for providing testimony in court as a lay or expert witness. This course addresses generalbackground relating to fraud, delves into the myriad types of financial fraud, corruption, employee theft, cybercrime, identitytheft, red collar crime, scams, and examines the trends in fraud detection and investigation. The goal is that, whether youbecome a fraud fighter, or continue in your management careers, you will leverage this course to prevent and detect fraud atyour workplace.
Restriction: Must be in Business and Management (Master's) program; or permission of BMGT-Robert H. Smith School of Business.

BUSO781 The Impact of Taxation on Business Entities (2 Credits)
Tax Strategies for Business Planning and Investment provides a study of how federal and state taxes affect business strategy. The course focuses on the taxation of business entities and transactions. Concepts of taxing jurisdictions, taxes as transaction costs, maxims of income tax planning and jurisdictional issues in taxation are reviewed with particular emphasis on their impact on business operations. The course examines the choice of business entity, examining the taxation of flow-through entities (partnerships, LLCs, and S corporations) and C corporations (separately taxed entities). The course also examines investment and personal financial planning.
Restriction: Must be in Business and Management (Master's) program; or permission of BMGT-Robert H. Smith School of Business.

BUSO782 Financial Planning and Control Systems for Managers and Consultants (2 Credits)
This course provides an analysis of several topics concerning financial planning/control systems (management accounting systems). Topics covered: design and use of cost management systems (including activity based costing systems), financial performance measures for enhancing firm value, managerial incentive contracts and accounting data, management accounting and Internet-based transactions, managing earnings and financial ratios, use of balanced scorecard to evaluate financial/nonfinancial managerial performance, management accounting systems and competitor analysis, behavioral aspects of budgeting, post-auditing of capital investments, accounting/economics aspects of information security, and transfer pricing.
Prerequisite: Permission of BMGT-Robert H. Smith School of Business. Or BUSO616; and BUSO602.
Restriction: Must be in Business and Management (Master's) program; or permission of BMGT-Robert H. Smith School of Business.
Credit Only Granted for: BMGT711 or BUSO782.
Formerly: BMGT711.

BUSO788 Business Consulting (1-4 Credits)
Selected advanced topics in the various fields of graduate study in business.
Restriction: Must be in Business and Management (Master's) program; or permission of BMGT-Robert H. Smith School of Business.
Repeatable to: 8 credits if content differs.
Credit Only Granted for: BUSI788 or BUSO788.

BUSO798 Special Topics in Business (1-4 Credits)
Selected advanced topics in the various fields of graduate study in business.
Prerequisite: Permission of BMGT-Robert H. Smith School of Business.
Restriction: Must be in Business and Management (Master's) program; or permission of BMGT-Robert H. Smith School of Business.
Repeatable to: 9 credits if content differs.

CBMG - Cell Biology & Molecular Genetics

CBMG613 Microbiomes in Health, Disease, and Application (2 Credits)
Investigation of microbiomes in human and animal health, disease, and industrial applications, with an emphasis on underlying functional mechanisms. No prior programming experience required.

CBMG626 Quantitative Modeling for Experimental Biologists (2 Credits)
A toolkit for understanding processes through the generation of useful models constrained by data. Topics explored include Simulations, Information Theory, Dynamical Systems, and Control Theory.
Prerequisite: BIOL705; or permission of the instructor .
Recommended: Some familiarity with programming (NetLogo, R and/or Python) is helpful.

CBMG688 Special Topics in Cell Biology and Molecular Genetics (1-4 Credits)
Presentation and discussion of fundamental problems and special subjects in the topics of Cell Biology and Molecular Genetics.
Formerly: MICB688.

CBMG699 Special Problems in Cell Biology and Molecular Genetics (1-3 Credits)
Emphasis is placed on research and discussion of current problems in the area of Cell Biology and Molecular Genetics.
Repeatable to: 10 credits if content differs.
Formerly: PBIO699.

CBMG789 Seminar in Cell Biology and Molecular Genetics (2 Credits)
Cell Biology and Molecular Genetics Department Seminar.
Repeatable to: 4 credits if content differs.
Formerly: MICB789.

CBMG799 Masters Thesis Research (1-6 Credits)
Master's Thesis Research in Cell Biology and Molecular Genetics.

CBMG898 Pre-Candidacy Research (1-8 Credits)
Pre-candidacy Research.

CBMG899 Doctoral Dissertation Research (1-8 Credits)
Doctoral Dissertation Research.

CCJS - Criminology and Criminal Justice

CCJS405 Gangs (3 Credits)
Provides students with a historical and contemporary examination of street and institutional gangs. We will address the nature and definition of gangs, types of gangs, and diversity of membership of gangs, theoretical explanations, and criminal and deviant behavior. In addition, we will analyze law enforcement responses, intervention and prevention strategies, and public policy issues.
Prerequisite: CCJS100 and CCJS105.
Credit Only Granted for: CCJS405 or CCJS498G.
Formerly: CCJS498G.

CCJS418 Seminar in Criminology and Criminal Justice (3 Credits)
Selected topics of interest in the field of Criminology and Criminal Justice will be covered.
Repeatable to: 18 credits if content differs.

CCJS428 Special Topics in Criminology and Criminal Justice (3 Credits)
Topics in various aspects of the field of criminology and criminal justice will be covered.
Repeatable to: 18 credits if content differs.

CCJS440 Security Administration (3 Credits)
Designed to introduce students to the complex issues of Security Administration and the critical terrorism issues facing the nation. Emphasis is placed on understanding the historical and contemporary issues effecting U.S. Counterterrorism Policy. It also explores the challenges facing today's security administrators including: ethics, classified information, intelligence, terrorist organizations and incidents, physical and personnel security, transportation and border security issues.
Prerequisite: CCJS100 and CCJS340.
Credit Only Granted for: CCJS440 or CCJS498Z.
Formerly: CCJS498Z.

CCJS444 Advanced Law Enforcement Administration (3 Credits)
The structuring of manpower, material, and systems to accomplish the major goals of social control. Personnel and systems management. Political controls and limitations on authority and jurisdiction.
Prerequisite: CCJS100 and CCJS340.

CCJS450 Advanced Juvenile Delinquency (3 Credits)
Examination of juvenile delinquency in the United States. Nature and extent of juvenile delinquency, historical approaches, sociological and criminological theories and research, social contexts including the institutions of families, schools, and peers, and social responses. Prevention, punishment, and treatment programs, both within and outside of the juvenile justice and criminal justice systems.
Prerequisite: CCJS105 and CCJS300.
Credit Only Granted for: CCJS350 or CCJS450.

CCJS451 Crime and Delinquency Prevention (3 Credits)
Methods and programs in prevention of crime and delinquency.
Prerequisite: CCJS105 and CCJS300.

CCJS453 White Collar and Organized Crime (3 Credits)
Definition, detection, prosecution, sentencing and impact of white collar and organized crime. Special consideration given to the role of federal law and enforcement practices.
Prerequisite: CCJS300; and (CCJS350 or CCJS105).

CCJS454 Contemporary Criminological Theory (3 Credits)
Examination of the main theoretical accounts that explain the underlying causes of criminal behaviors. Explore how individual choices, socialization experiences, biological factors and social structure affect criminal behaviors.
Prerequisite: CCJS300 and CCJS105.

CCJS458 Special Topics in Study Abroad IV (1-6 Credits)
Special topics course taken as part of an approved study abroad program.
Repeatable to: 15 credits if content differs.

CCJS460 Victim Advocacy (3 Credits)
Introduces the practice of victim advocacy as a profession. Students will develop an understanding of the impact of crime on the victim, and how crime impacts the path of the victim through the criminal justice and other administrative processes. A special emphasis of the course will be on introducing the students to different contexts of victim advocacy, e.g. system-based, campus-based, military-based, and community-based, as well as special topics impacting the profession of victim advocacy, e.g. grief, death notification, child protection, violence intervention, and trauma therapy. Students will also develop an understanding about how race, gender, age, sexual orientation, and ethnicity impact the way in which victims are offered and receive advocacy in different systems.
Prerequisite: CCJS100.
Recommended: CCJS360.
Credit Only Granted for: CCJS460 or CCJS498T.
Formerly: CCJS498T.

CCJS461 Psychology of Criminal Behavior (3 Credits)
Biological, environmental, and personality factors which influence criminal behaviors. Biophysiology and crime, stress and crime, maladjustment patterns, psychoses, personality disorders, aggression and violent crime, sex-motivated crime and sexual deviations, alcohol and drug abuse, and criminal behavior.
Prerequisite: CCJS105 and CCJS300.

CCJS489 Honors Thesis Research (3 Credits)
Designed for students completing their honors thesis.
Prerequisite: CCJS100 and CCJS105.
Restriction: Limited to CCJS Departmental Honors students.
Repeatable to: 6 credits.

CCJS498 Selected Topics in Criminology and Criminal Justice (3 Credits)
Topics of special interest to advanced undergraduates in criminology and criminal justice. Offered in response to student request and faculty interest.
Repeatable to: 6 credits if content differs.

CCJS600 Criminal Justice (3 Credits)
Current concept of criminal justice in relationship to other concepts in the field. Historical perspective. Criminal justice and social control. Operational implications. Systemic aspects. Issues of evaluation.
Restriction: Must be in one of the following programs (Criminology and Criminal Justice (Master's); Criminology and Criminal Justice (Doctoral)) ; or permission of BSOS-Criminology & Criminal Justice department.
Formerly: CJUS600.

CCJS601 Policing (3 Credits)
An introduction to research, theory, and applications of the causes and consequences of police behavior. Community policing, problem-solving methods, police discretion, police misconduct, police crime prevention strategies, and restorative justice.

CCJS602 Courts and Sentencing (3 Credits)
Research and theory on prosecution, plea-bargaining, sentencing principles and guidelines, and sentencing policies in practice. Mandatory minimum sentencing, "three strikes" laws, race, gender and class disparities, general and specific deterrent effects of sentencing, restitution and restorative justice, diversion and sentencing to treatment.

CCJS604 Policy Analysis Project (3 Credits)
An application of statistical and conceptual tools to criminal justice data in the student's area of concentration, resulting in a paper reporting the conceptualization, analytic methods and results. The topic of the independent study will be chosen through individual consultation with the instructor.

CCJS605 Program Evaluation for Criminal Justice (3 Credits)
Designing, implementing and evaluating programs in criminal justice. Topics include diagnosing program needs, planning and tailoring evaluation programs, program monitoring, assessing program impact, program efficiency, and the social context of evaluation.
Credit Only Granted for: CCJS605 or CCJS609.
Formerly: CCJS609.

CCJS610 Research Methods in Criminal Justice and Criminology (3 Credits)
Examination of special research problems and techniques.
Formerly: CRIM610.

CCJS611 Statistical Tools for Criminal Justice (3 Credits)
An introduction to essential statistical concepts for analyzing crime and evaluating criminal justice policies. Interpreting crime trends and correlations, risk and conditional probability analysis for repeat offenders and hot spots of crime, time series analysis, experimental statistics, effect sizes, statistical power and significance.

CCJS613 Criminal Justice System in China (3 Credits)
The main contents of this course include: the overall characteristics of the Chinese judicial system, the horizontal comparison of the judicial system between China and the United States, the investigation system, the pre-trial detention system, the defense system, the prosecutorial system, the trial system, the sentencing system, the correction and community correction system, as well as the minor judicial system in the criminal justice system of China.
Restriction: Must be in the Criminology and Criminal Justice Professional Master's Program in Nanjing China.
Credit Only Granted for: CCJS678G or CCJS613.
Formerly: CCJS678G.

CCJS614 Criminal Law (3 Credits)
Chinese criminal law and its interpretation, principles, and methods.
Restriction: Students enrolled in the CCJS Masters Program in China.
Credit Only Granted for: CCJS614 or CCJS678F.
Formerly: CCJS678F.

CCJS615 Criminal Procedure Law (3 Credits)
This course is intended to introduce students to basic issues in China's criminal procedure law.
Credit Only Granted for: CCJS678E or CCJS615.
Formerly: CCJS678E.

CCJS616 International Law and Process (3 Credits)
International law in globalized world and its functions.
Restriction: Students in the CCJS Masters program in China.
Credit Only Granted for: CCJS616 or CCJS678D.
Formerly: CCJS678D.

CCJS620 Fundamentals of Criminological Research (3 Credits)
Designed to help criminology students understand and apply three important components of statistics: decriptive statistics (including probability theory), fundamentals of statistical inference, and regression analysis. Course assumes familiarity with basic descriptive statistics. The emphasis of the classes on descriptive statistics is the calculation and interpretation of summary statistical measures for describing raw data. Covers the basic rules of probability and different probabilistic processes that could describe criminal activity. The sessions on fundamentals of statistical inferences are designed to provide background for executing and interpreting hypothesis tests and confidence intervals. The latter portion of the course focuses on regession analysis. Uses the statistical software, Stata.
Credit Only Granted for: CCJS498D or CCJS620.
Formerly: CCJS498D.

CCJS621 General Linear Models in Criminal Justice Research (3 Credits)
An in-depth exploration of applied linear regression analysis. Covers characteristics of estimates, such as unbiasedness and efficiency. Encourages fluency with the theoretical issues involved in the basic linear regression using simple algebra, familiarity with the general model using matrix algebra, and fluency with the computer application of multivariate regressions and the probit/logit models.
Prerequisite: CCJS620.
Credit Only Granted for: CCJS498F or CCJS621.
Formerly: CCJS498F.

CCJS631 Ethics in Criminal Justice (3 Credits)
Provides students with an overview of the major ethical perspectives, which are typically used to inform and justify the workings of the criminal justice system. The course draws on a number of case studies in order to introduce students to a broad range of ethical dilemmas, and students develop and hone a decision-making process designed to resolve such dilemmas.
Restriction: Must be in one of the following programs: Criminology and Criminal Justice (Master's); Criminology and Criminal Justice (Doctoral); Sociology (Master's); Sociology (Doctoral); or permission from BSOS-Criminology & Criminal Justice department.

CCJS632 Making Sense of Criminal Justice Methods and Statistics (3 Credits)
Teaches students how to better understand research that relies on statistics and to then apply this understanding to common criminal justice problems. The course will introduce basic statistical concepts that are necessary for analyzing crime and evaluating criminal justice programs and policies. Students will learn to interpret and assess the quality of reports that present crime trends, descriptive statistics, correlations, data mining efforts, geo-spatial and social media analytics, risk analysis for repeat offenders, hot spots of crime, and experimental research. By the end of the semester, students will learn to assess critically the quality of published research and evaluate its implications for criminal justice policy.
Restriction: Must be in one of the following programs: Criminology and Criminal Justice (Master's); Criminology and Criminal Justice (Doctoral); Sociology (Master's); Sociology (Doctoral); Master of Professional Studies in Public Safety Leadership and Administration (MPLA); Graduate Certificate in Criminal Justice Administration (Z130); or permission from BSOS-Criminology & Criminal Justice department.

CCJS633 Translating Research into Practice (3 Credits)
Law enforcement policy and practice is increasingly "evidence based." This course will focus on understanding data sources and the fundamentals of research methodology, focusing on how data and methodological choices shape the conclusions that can be drawn. At the end of this course, students will be able to discern between research of good and poor quality and understand the crucial benefits of evaluation.
Prerequisite: CCJS632.
Restriction: Permission of BSOS-Criminology & Criminal Justice department.

CCJS635 Minorities and Criminal Justice (3 Credits)
Role minorities play in the criminal justice system: as victims, offenders and professionals. Also provides theoretical framework for examining these roles.
Prerequisite: CCJS600; or students who have taken courses with comparable content may contact the department.

CCJS651 Seminar in Criminology (3 Credits)
Analysis of significant recent issues in Criminology.
Formerly: CRIM651.

CCJS652 Seminar in Juvenile Delinquency (3 Credits)
Analysis of delinquency and its control.
Formerly: CRIM652.

CCJS653 Seminar in Corrections (3 Credits)
Development, operation and future of correctional systems.
Prerequisite: CCJS651; or students who have taken courses with comparable content may contact the department.
Formerly: CRIM653.

CCJS654 History of Criminological Thought (3 Credits)
A study of the development of criminological thought from antiquity to the present.
Prerequisite: CCJS454; or students who have taken courses with comparable content may contact the department.
Formerly: CRIM654.

CCJS660 Gender and Crime (3 Credits)
Assumptions, biases, and relative strengths and weaknesses of theories of crime as applied to women. Criminal justice sanctioning of crimes by and against women. The course will also explore occupational segregationby gender in criminal justice professions, particularly in the fields ofpolicing, courts (attorneys and judges), and corrections (correctionalofficers and treatment staff).

CCJS661 Crime and the Life Course (3 Credits)
Designed to provide an intensive examination of crime and the life course. Life course is examined as a theoretical orientation, a research methodology, and an empirical field of study with special reference to crime and deviance. Course includes development of criminal behavior and criminal careers; stability and change in criminal behavior across developmental stages; trajectories, transitions, and turning points through life; quantitative and qualitative approaches to studying crime and the life course; and social change and its link to individual lives.
Credit Only Granted for: CCJS699J or CCJS661.
Formerly: CCJS699J.

CCJS663 Issues in Corporate Crime (3 Credits)
Overview of what is known about corporate crime and criminals (e.g.: similarities to and differences from other offenders and crime types; characteristics of offenders and victims; what counts as corporate crime ; introduction to theoretical frameworks.) Readings and class materials will coalesce around specific issues about which there is much debate but scant empirical research. Discussions will center around what is known, what is not, what needs to be done and how.
Credit Only Granted for: CCJS699S or CCJS663.
Formerly: CCJS699S.

CCJS664 Regulating Vice and Regulating Organized Crime (3 Credits)
For this course, vice is defined as a habit with bad consequences that can generate large black markets if the market for supplying that habit is prohibited or heavily regulated. Vice if found in all modern societies, though in widely differing forms, depending on population characteristics, culture and law. Society's decision is how to regulate it, whether criminally or otherwise, and how then to assess whether the regulation is successful. This assessment has multiple components, including: choosing outcome measures; modeling counterfactuals for which the evidence is often very indirect and developing a framework for ensuring that comparisons reflect all relevant outcomes and values.
Credit Only Granted for: CCJS699V or CCJS664.
Formerly: CCJS699V.

CCJS670 Race, Crime, and Criminal Justice (3 Credits)
Provides an historical overview of the operation and evolution of the criminal justice system and the impact of race. How race affects definitions of crime and criminality, the workings of the criminal justice system, the development of criminological theory, and the role of criminal justice ethics in the study of race and crime will be considered.

CCJS671 Technology in Modern Policing (3 Credits)
Leaders in law enforcement must be able to effectively evaluate, deploy, and manage technology projects. This course covers state-of-the-art technologies used in everyday policing, as well as emerging and future technologies. Students evaluate technological solutions to public safety problems from a legal/policy and privacy/optics perspective, from a procurement and budgetary perspective, and from a technical perspective. Students learn the challenges and best practices associated with deploying major technology projects. This course covers the underlying technical aspects of these technologies at a high level, such that students are able to successfully make informed decisions.

CCJS678 Advanced Topics in Criminology and Criminal Justice (3 Credits)
An analysis of contemporary issues in criminology and criminal justice with special emphasis on research and theory developments.
Prerequisite: CCJS600.
Repeatable to: 12 credits if content differs.

CCJS699 Special Criminological Problems (1-3 Credits)
Supervised study of a selected problem in the field of criminal justice.
Restriction: Permission of BSOS-Criminology & Criminal Justice department.
Repeatable to: 6 credits.
Formerly: CJUS699.

CCJS700 Advanced Research Methods in Criminology and Criminal Justice (3 Credits)
An in-depth inventory of the methods of criminological research. It considers the philosophy of science and research ethics; discusses sampling, measurement and methods of data collection, including survey, experimental, evaluation, and qualitative research.
Prerequisite: CCJS610.

CCJS710 Advanced Statistics Methods - Limited Dependent Variables (3 Credits)
Application of advanced data analysis strategies to criminological and criminal justice problems, with specific focus on limited dependent variables.
Prerequisite: Must have completed an approved doctoral level statistics course.
Formerly: CRIM710.

CCJS712 Longitudinal Data Analysis with Latent Variables (3 Credits)
This course is designed for graduate students with an interest in the use of latent variables in longitudinal data analysis as it is conceptualized in the Mplus framework. This course explores more general features of latent variable analyses as they are related to longitudinal modeling. Topics to be covered include latent growth analysis with a combination of continuous and categorical latent variables as well as the inclusion of continuous and categorical variables as predictors and outcomes.
Credit Only Granted for: CCJS699F or CCJS712.
Formerly: CCJS699F.

CCJS720 Criminal Justice System Planning: Policy Analysis for Crime Control (3 Credits)
System theory and method; examination of planning methods and models based primarily on a systems approach to the operations of the criminal justice system.
Prerequisite: Must have completed 1 course in research methodology; and 1 course in CCJS.
Formerly: CJUS720.

CCJS799 Master's Thesis Research (1-6 Credits)
Formerly: CRIM799.

CCJS898 Pre-Candidacy Research (1-8 Credits)

CCJS899 Doctoral Dissertation Research (1-8 Credits)
Doctoral dissertation research in criminal justice and criminology.
Formerly: CRIM899.

CHBE - Chemical and Biomolecular Engineering

CHBE409 Undergraduate Honors Seminar (1 Credit)
Students will attend and write summaries of departmental seminars, along with professional development activities
Restriction: Must be in a major within the ENGR-Chemical & Biomolecular Engineering department; and Permission of ENGR-Chemical & Biomolecular Engineering department; and Must be in the Chemical Engineering Honors Program.
Repeatable to: 2 credits.

CHBE410 Statistics and Design of Experiments (3 Credits)
An introduction to probability, statistics, and design of experiments for chemical engineers.
Prerequisite: Minimum grade of C- in CHBE250, MATH241, and MATH246.
Restriction: Must be in a major within the ENGR-Chemical & Biomolecular Engineering department; and permission of ENGR-Chemical & Biomolecular Engineering department.
Credit Only Granted for: CHBE410 or ENCH476.
Formerly: ENCH476.

CHBE422 Chemical and Biomolecular Engineering Transport Phenomena I (3 Credits)
Principals of fluid dynamics as applied to model development and process design. Mass, momentum and energy conservation. Statics and surface tension. Equation of Continuity and Navier-Stokes Equation with application to laminar flow. Dimensional analysis. Macroscopic balances, Bernoulli Equation and friction factors with application to turbulent flow.
Prerequisite: Minimum grade of C- in CHBE101, CHBE250, MATH241, and MATH246.
Restriction: Must be in a major within the ENGR-Chemical & Biomolecular Engineering department; and permission of ENGR-Chemical & Biomolecular Engineering department.
Credit Only Granted for: CHBE422 or ENCH422.
Formerly: ENCH422.

CHBE424 Chemical and Biomolecular Engineering Transport Phenomena II (3 Credits)
Principles of mass and heat transfer as applied to model development and process design. Species continuity equation with application to diffusion, and convection in laminar flow. Macroscopic balances and mass transfer coefficients with application to turbulent flow. Microscopic equation of energy with application to heat conduction, and convection in laminar flow. Macroscopic energy balance and heat transfer coefficients with application to turbulent flow. Heat exchanger design.
Prerequisite: CHBE422.
Corequisite: CHBE302.
Restriction: Must be in Engineering: Chemical program; and permission of ENGR-Chemical & Biomolecular Engineering department.
Credit Only Granted for: CHBE424 or ENCH424.
Formerly: ENCH424.

CHBE426 Chemical and Biomolecular Separation Processes (3 Credits)
Separation by stages operations. Rate dependent separation processes. Design application in distillation, gas absorption, liquid extraction, drying, adsorption and ion exhange.
Corequisite: CHBE302; and CHBE424.
Restriction: Must be in Engineering: Chemical program; and permission of ENGR-Chemical & Biomolecular Engineering department.
Credit Only Granted for: CHBE426 or ENCH426.
Formerly: ENCH426.

CHBE437 Chemical and Biomolecular Engineering Laboratory (3 Credits)
Application of chemical engineering process and unit operation principals in small-scale semi-commercial equipment. Data from experimental observations are used to evaluate performance and efficiency of operations. Emphasis on correct presentation of results inreport form.
Prerequisite: CHBE424, CHBE426, and CHBE440.
Restriction: Must be in a major within ENGR-Chemical & Biomolecular Engineering department; and permission of ENGR-Chemical & Biomolecular Engineering department.
Credit Only Granted for: CHBE437 or ENCH437.
Formerly: ENCH437.

CHBE440 Chemical Kinetics and Reactor Design (3 Credits)
Fundamentals of chemical reaction kinetics and their application to the design and operation of chemical reactors. Reaction rate theory, homogeneous reactions and catalysis electrochemical reactions. Catalytic reactor design.
Prerequisite: Minimum grade of C- in CHBE301, MATH241, and MATH246.
Restriction: Must be in Engineering: Chemical program; and permission of ENGR-Chemical & Biomolecular Engineering department.
Credit Only Granted for: CHBE440 or ENCH440.
Formerly: ENCH440.

CHBE442 Chemical and Biomolecular Systems Analysis (3 Credits)
Dynamic response applied to process systems. Goals and modes of control, Laplace transformations, analysis and synthesis of simple control systems, closed loop response, dynamic testing.
Prerequisite: CHBE424 and CHBE426.
Credit Only Granted for: CHBE442 or ENCH442.
Formerly: ENCH442.

CHBE444 Process Engineering Economics and Design I (3 Credits)
Principles of chemical engineering economics and process design. Equipment sizing and costing. Economic evaluation of projects. Flowsheet synthesis. Introduction to flowsheet simulators and concepts of flowsheet optimization. Synthesis of Heat Exchanger Networks and Distillation Sequences.
Prerequisite: CHBE424, CHBE426, and CHBE440.
Restriction: Must be in a major within the ENGR-Chemical & Biomolecular Engineering department; and permission of ENGR-Chemical & Biomolecular Engineering department.
Credit Only Granted for: CHBE444 or ENCH444.
Formerly: ENCH444.

CHBE446 Process Engineering Economics and Design II (3 Credits)
Application of chemical engineering principles for the design of chemical processing equipment. Representative problems in the design of chemical plants will be the focus of this capstone design class. Comprehensive reports are required.
Prerequisite: CHBE442 and CHBE444.
Restriction: Must be in a major within the ENGR-Chemical & Biomolecular Engineering department; and permission of ENGR-Chemical & Biomolecular Engineering department.
Credit Only Granted for: CHBE446 or ENCH446.
Formerly: ENCH446.

CHBE451 Photovoltaics: Solar Energy (3 Credits)
The emphasis of the class is on developing a conceptual understanding of the device physics and manufacturing processes of crystalline and thin-film photovoltaic cells, and to develop elementary computational skills necessary to quantify solar cell efficiency. The class material includes detailed, system-level energy balances necessary to understand how solar energy fits into the complete energy generation, conversion, and storage picture. Quantitative comparisons of PV technology to solar chemical conversion processes and biofuels are made.
Jointly offered with: CHBE651.
Restriction: Permission of ENGR-Chemical & Biomolecular Engineering department.
Credit Only Granted for: ENCH468L, CHBE451 or CHBE651.
Formerly: ENCH468L.

CHBE452 Introduction of Machine Learning in Chemical Engineering (3 Credits)
Introduction of data science and machine learning approaches to modern problems in chemical engineering and materials science. This course develops data science approaches, including their foundational mathematical and statistical basis, and applies these methods to data sets of limited size and precision. Methods for regression and clustering will be developed and applied, with an emphasis on validation and error quantification. Techniques that will be developed include linear and nonlinear regression, clustering and logistic regression, dimensionality reduction, unsupervised learning, and artificial neural networks. These methods will be applied to a range of engineering problems, including conducting polymers, stretchable conductors, organic synthesis, and quality control in manufacturing.
Recommended: Basic knowledge of chemical engineering, materials science, ordinary differential equations, and Python is desirable.
Jointly offered with: CHBE652.
Restriction: Permission of Department or Instructor.
Credit Only Granted for: CHBE452 or CHBE652.

CHBE454 Chemical Process Analysis and Optimization (3 Credits)
Application of mathematical models to the analysis and optimization of chemical processes. Models based on transport, chemical kinetics and other chemical engineering principles will be employed.
Credit Only Granted for: CHBE454 or ENCH454.
Formerly: ENCH454.

CHBE455 Model Predictive Control (3 Credits)
Empirical model identification from process data. Step and impulse response models. Linearization of nonlinear first principles models. Single variable Model Predictive Control. Robustness with respect to modeling error. MPC based tuning of PID controllers. Feedforward control. Multi-input multi-output processes. Multi-loop decentralized control. Centralized multivariable Model Predictive Control via on-line optimization.
Credit Only Granted for: CHBE455 or ENCH455.
Formerly: ENCH455.

CHBE457 Design and Processing of Polymers for Biomedical Devices (3 Credits)
Provides a foundation for understanding the use of various materials in medical applications. We will discuss design principles, based on biological context for drug delivery, diagnosis of disease, imaging applications, tissue engineering, among other relevant topics. The course will cover nanomedicine approaches (lipids, polymers, gold nanoparticles, carbon nanotubes, etc.), as well as scaffolds for tissue engineering and regenerative medicine. We will discuss advantages, challenges, and recent advances in the field. The course will highlight the importance of rational engineering when designing products to be used to treat and diagnose disease.
Prerequisite: MATH246; and CHEM231; and (CHBE301, ENMA461, or BIOE232).
Recommended: Knowledge of basic fluid dynamics: CHBE422/BIOE331 or equivalent.
Restriction: Permission of ENGR-Chemical & Biomolecular Engineering department.
Credit Only Granted for: BIOE453, CHBE457, or ENMA425.

CHBE468 Research (1-3 Credits)
Investigation of a research project under the direction of a faculty member. Comprehensive reports are required.
Restriction: Permission of Chemical and Biomolecular Engineering Department; and must be third or fourth year student; and must have minimum GPA of 3.0; and must have successfully completed all lower level engineering, science and mathematics courses for the major.
Repeatable to: 6 credits.
Formerly: ENCH468.

CHBE469 Special Projects (1-3 Credits)
Special project under the direction of a faculty member. Comprehensive reports are required.
Restriction: Permission of Chemical and Biomolecular Engineering Department; and must be third or fourth year student; and must have minimum GPA of 3.0; and must have successfully completed all lower level engineering, science and mathematics courses for the major.
Repeatable to: 6 credits if content differs.

CHBE470 Colloid and Interface Science (3 Credits)
Introduction to colloidal systems and interfacial science. Topics include preparation, stability and coagulation kinetics of colloidal suspensions. Introduction to DLVO theory, electrokinetic phenomena, colloidal aggregation, interfacial phenomena, double layer theory, surface chemistry. Discussion of interfacial thermodynamics and interfacial forces for solid-liquid interfaces. Applications to nanomaterial synthesis, nanomaterial and polymer self-assembly, protein-protein interactions, and protein aggregation will be discussed.
Prerequisite: CHBE424 and CHBE426.
Jointly offered with: CHBE670.
Restriction: Must be in a major within the ENGR-Chemical & Biomolecular Engineering department; and permission of ENGR-Chemical & Biomolecular Engineering department.
Credit Only Granted for: ENCH648F, CHBE470 or CHBE670.

CHBE471 Particle Science and Technology (3 Credits)
Particles are everywhere. We breathe them, eat them, and use them to make many non-particulate materials. Knowledge of particle science and technology is important for manufacturing, for occupational health and safety, as well as environmental considerations. In this multidisciplinary course, the focus will be on the study of science and technology relevant to multiphase systems consisting of solid and/or liquid particles surrounded by a gas. These topics fall loosely under the headings of powder and aerosol technology. Team design projects will be an integral component.
Prerequisite: Knowledge of undergraduate engineering thermodynamics, and transport phenomena; knowledge of numerical methods for solving systems of ordinary differential equations.
Restriction: Must be in a major within ENGR-Chemical & Biomolecular Engineering department; or permission of ENGR-Chemical & Biomolecular Engineering department.
Credit Only Granted for: CHBE471 or ENCH471.
Formerly: ENCH471.

CHBE472 Control of Air Pollution Sources (3 Credits)
Sources and effects of air pollutants, regulatory trends, atmospheric dispersion models, fundamentals of two-phase flow as applied to air pollution and air pollution control systems, design of systems for control of gases and particulate matter.
Jointly offered with: CHBE672.
Restriction: Permission of ENGR-Chemical & Biomolecular Engineering department.
Credit Only Granted for: CHBE472, CHBE672 or ENCH672.

CHBE473 Advanced Batteries and Fuel Cells (3 Credits)
The lecture will start from the basic electrochemical thermodynamics and kinetics, with emphasis on electrochemical techniques, fundamental principle and performance of batteries, and supercapacitors.
Jointly offered with: CHBE673.
Restriction: Permission of ENGR-Chemical & Biomolecular Engineering department.
Credit Only Granted for: CHBE473 or CHBE673.

CHBE474 Biopharmaceutical Process Development and Manufacturing (3 Credits)
Covers the fundamental steps involved in process development and manufacturing of biopharmaceuticals. An overview of different classes of biopharmaceuticals as well as manufacturing requirements for clinical development and regulatory approval will be provided. In depth coverage of manufacturing steps including cell culture, purification and formulation as well as drug product manufacturing, analysis and stability will be covered. Scientific literature will be used to highlight current challenges and novel solutions in each step of the manufacturing process. Scale up considerations, GMP requirements and process economics will also be introduced.
Prerequisite: BIOE120; and permission of instructor.
Jointly offered with: CHBE674.
Restriction: Permission of ENGR-Chemical & Biomolecular Engineering department.
Credit Only Granted for: CHBE474, BIOE489T, ENCH648D or CHBE674.

CHBE475 Ethics in Science and Engineering (3 Credits)
Ethical issues in science and engineering and their resolutions are examined. The main topics will be ethics and scientific truth (including issues of proper data analysis, proper data presentation, and record-keeping), ethics and other scientists and engineers (including issues of attribution, confidentiality, conflicts of interest, mentoring, and inclusion of under-represented groups), ethics and the practice of engineering (including responsibilities of engineers to clients, ecological issues, and conflicts of interest), and ethics and society (including funding priorities, moral issues, and human and animal subjects). Class meetings will be organized around discussions, case studies, and student reports. The course is aimed at postdoctoral students, graduate students and advanced undergraduate students who wish to ponder the important contemporary questions about the ethics of how science and engineering get done.
Credit Only Granted for: CHBE475 or ENCH475.
Formerly: ENCH475.

CHBE476 Molecular Modeling Methods (3 Credits)
Statistical mechanics will be introduced to give the fundamental background for atomic to mesoscale molecular modeling. Classical atomic-level simulations methods (Monte Carlo and Molecular Dynamics) and the procedures to develop intra- and intermolecular potentials will be covered. This course will also discuss the theory and application of coarse-grained molecular simulations, mesoscale simulations and other modern simulation techniques. A broad range of applications will be included throughout the semester, e.g., phase behavior of small molecules, kinetics, and biophysics.
Jointly offered with: CHBE476.
Restriction: Permission of ENGR-Chemical & Biomolecular Engineering department.
Credit Only Granted for: ENCH648P, CHBE476 or CHBE676.
Formerly: ENCH468P.

CHBE477 Mesoscopic and Nanoscale Thermodynamics (3 Credits)
Interdisciplinary course primarily for graduate and senior undergraduate students from engineering or science departments. New emerging technologies deal with bio-membrane and gene engineering, microreactor chemistry and microcapsule drug delivery, micro-fluids and porous media, nanoparticles and nanostructures, supercritical fluid extraction and artifical organs. Engineers often design processes where classical thermodynamics may be insufficient, e.g., strongly fluctuating and nanoscale systems, or dissipative systems under conditions far away from equilibrium.
Prerequisite: A prior course in classical thermodynamics.
Jointly offered with: CHBE477.
Restriction: Must be in a major within the ENGR-Chemical & Biomolecular Engineering department; and permission of ENGR-Chemical & Biomolecular Engineering department.
Credit Only Granted for: CHBE477, ENCH468Q or CHBE677.
Formerly: ENCH468Q.

CHBE480 Bionanotechnology: Physical Principles (3 Credits)
Physics at nano/micro scales. Biomolecular building blocks. Simplest biomolecular assembly: protein folding. Nanoscale intermolecular interactions important for biology. Protein-ligand binding. Protein higher-order assembly: filaments, networks. Protein filaments and motility. DNA, RNA and their assembly assisted by proteins. Viral capsid assembly. Lipid assembly into micelles, bilayers. Lipid-protein co-assembly in membranes. Lipid and polymer structures useful in medicine. Targeted delivery of drugs, genes by nano/micro structures. Cellular assembly in the eye, in insect wings. Cellular assembly at surfaces: gecko feet, duck feathers. Cellular assembly in the presence of crystals: biomineralization.
Prerequisite: BIOE120; or students who have taken courses with comparable content may contact the department.
Jointly offered with: CHBE680.
Restriction: Permission of ENGR-Chemical & Biomolecular Engineering department.
Credit Only Granted for: ENCH648N, CHBE480 or CHBE680.

CHBE481 Transport Phenomena in Small and Biological Systems (3 Credits)
Interdisciplinary course primarily for senior undergraduate and graduate students from engineering or science departments. The course's main goal is to make the students familiar with the fundamental physics and modeling of transport phenomena in small and biological systems, and their current scientific and engineering utilization in microfluidics, nanofluidics and biological systems.
Jointly offered with: CHBE681.
Restriction: Permission of ENGR-Chemical & Biomolecular Engineering department.
Credit Only Granted for: ENCH468W, CHBE481 or CHBE681.
Formerly: ENCH468W.
Additional Information: Adding graduate course to jointly offered and credit only granted for fields.

CHBE483 Bioseparations (3 Credits)
Engineering fundamentals of separations and purification of biological molecules. Case studies and examples illustrate principles and practice of centrifugation, precipitation, crystallization, filtration, membrane separations, chromatography, and affinity separation of recombinant proteins and other biomolecules. Process scale-up and economics of biotechnology products and processes.
Restriction: Permission of ENGR-Chemical & Biomolecular Engineering department.
Credit Only Granted for: ENCH483 or CHBE483.
Formerly: ENCH483.

CHBE484 Metabolic Pathway Engineering (3 Credits)
The state-of-the-art in metabolic engineering, with a focus on the analysis and engineering of metabolic pathways through (chemical) engineering principles, will be covered. Topics covered include: (1) overview of biochemistry and metabolism; (2) metabolic flux analysis and isotope labeling illustrated with examples from the recent scientific literature; (3) technologies for engineering metabolic pathways; (4) metabolic control analysis and pathway regulation; (5) applications of metabolic engineering to synthesis of biofuels and therapeutics; (6) specialized and related subjects such as protein engineering and synthetic biology.
Prerequisite: CHBE101 and CHBE440.
Jointly offered with: CHBE684.
Restriction: Permission of ENGR-Chemical & Biomolecular Engineering department.
Credit Only Granted for: ENCH468M, CHBE484 or CHBE684.
Formerly: ENCH468M.

CHBE485 Biochemical Engineering Laboratory (3 Credits)
Techniques of measuring pertinent parameters in fermentation reactors, quantification of production variables for primary and secondary metabolites such as enzymes and antibiotics, the insolubilization of enzymes for reactors, and the demonstration of separation techniques such as ultrafiltration and affinity chromatography.
Credit Only Granted for: CHBE485 or ENCH485.
Formerly: ENCH485.

CHBE486 Heterogeneous Catalysis for Energy Applications (3 Credits)
Introduction to heterogeneous catalytic science and technology for energy conversion and hydocarbon processing. Preparation and mechanistic characterization of catalyst systems, kinetics of catalyzed reactions, adsorption and diffusion influences in heterogenious reactions. An overview of heterogeneous catalysis in various energy-related applications, including petroleum refining, chemicals from biomass, valorization of shale gas, and CO2 utilization will be introduced.
Prerequisite: Minimum grade of C- in CHBE302, CHBE424, and CHBE440; and permission of instructor.
Restriction: Must be in a major within the ENGR-Chemical & Biomolecular Engineering department.
Credit Only Granted for: CHBE486, CHBE686 or ENCH686.

CHBE490 Polymer Science (3 Credits)
The elements of the polymer chemistry and industrial polymerization, polymer structures and physics, thermodynamics of polymer solutions, polymer processing methods, and engineering applications of polymers.
Credit Only Granted for: CHBE490, ENCH490, or ENMA495.
Formerly: ENCH490.

CHBE491 Electrochemical Energy Engineering (3 Credits)
Introduces students to the fundamentals of electrochemical engineering, covering thermodynamics, kinetics, and transport in electrochemical cells, as well as electrode structures and electroanalytical techniques. The course will next transition to focus on electrochemical devices, including batteries, fuel cells, and other devices as guided by student input. This course will serve as a foundation for students who are interested in becoming practicing electrochemical engineers, those who would like to pursue research careers, and those who wish to become familiar with a specialized area within engineering that will have a crucial and growing importance during their careers.
Prerequisite: CHBE302, CHBE440, and CHBE422.
Jointly offered with: CHBE691.
Restriction: Permission of ENGR - Chemical & Biomolecular Engineering Department.
Credit Only Granted for: CHBE691 or CHBE491.

CHBE493 Chemical Processes in Beer Brewing (3 Credits)
Covers chemical engineering principles and chemical processes involved in the brewing and quality control of beer. Topics will include extraction and isomerization of bittering compounds from hops, enzymatic reactions involved in mashing beer, colloidal chemistry of haze formation, and microbiology of yeast and fermentation. Quantitative models will be applied to these processes based on fundamental chemical engineering principles from reaction kinetics, thermodynamics, transport phenomena, and colloid and interfacial science.
Prerequisite: Minimum grade of C- in CHBE424 and CHBE440; and permission of instructor.
Restriction: Must be in a major within the ENGR-Chemical & Biomolecular Engineering department; and permission of ENGR- & Biomolecular Engineering department.
Credit Only Granted for: CHBE493 or CHBE693.
Additional Information: Neither the students nor the instructor will be making or working with alcoholic beverages in the course.

CHBE494 Sustainable Separations and Carbon Capture (3 Credits)
Provides a comprehensive overview of sustainable separations and carbon dioxide capture using synthetic membranes and sorbents.
Prerequisite: Minimum grade of C- in CHBE424, CHBE426 and CHBE440; and permission of instructor.
Restriction: Must be in a major within the ENGR-Chemical & Biomolecular Engineering department; and must have permission of ENGR- & Biomolecular Engineering department.
Credit Only Granted for: CHBE494 or CHBE694.

CHBE496 Polymeric Materials: Structure, Property, and Processing (3 Credits)
An intermediate level treatment of structures of polymers. An introduction to mechanical properties and processing of polymeric materials. Emphasis will be on how to establish the structure-property relationship and on how to achieve such understanding via different characterization methods.
Prerequisite: ENMA300; and permission of ENGR-Materials Science & Engineering department.
Cross-listed with: ENMA496.
Credit Only Granted for: ENMA496 or CHBE496.

CHBE497 Protein Engineering (3 Credits)
This course will cover the fundamentals of protein engineering and its applications in medicine, chemical processes, and energy. Topics will include the structure and function of biological molecules, rational design and directed evolution, construction of protein and peptide libraries, protein screening platforms, methods for characterizing structure and function of biological molecules. Scientific literature will be used to highlight key discoveries and current work in protein engineering.
Prerequisite: BIOE120, CHBE302, and CHBE440; and permission of instructor.
Jointly offered with: CHBE697.
Credit Only Granted for: CHBE497, BIOE489R, ENCH 648P or CHBE697.

CHBE608 Research in Chemical Engineering (1 Credit)
Students gain experience in research through lab rotations and experience presenting their findings.
Restriction: Must be in the Chemical Engineering Doctoral or Master of Science program.
Repeatable to: 8 credits.

CHBE609 Graduate Seminar (1 Credit)
Seminar in Chemical and Biomolecular Engineering
Repeatable to: 4 credits.

CHBE610 Chemical Engineering Thermodynamics (3 Credits)
Advanced application of the general thermodynamic methods to chemical engineering problems. First and second law consequences; estimation and correlation of thermodynamic properties; phase and chemical reaction equilibria.
Prerequisite: CHBE301; and CHBE302. Or students who have taken courses with comparable content may contact the department.
Restriction: Permission of ENGR-Chemical & Biomolecular Engineering department.
Credit Only Granted for: ENCH610 or CHBE610.
Formerly: ENCH610.

CHBE620 Methods of Engineering Analysis (3 Credits)
Application of selected mathematical techniques to the analysis and solution of engineering problems; included are the applications of matrices, vectors, tensors, differential equations, integral transforms, and probability methods to such problems as unsteady heat transfer, transient phenomena in mass transfer operations, stagewise processes, chemical reactors, process control, and nuclear reactor physics.
Prerequisite: MATH246 and CHBE250; or students who have taken courses with comparable content may contact the department.
Credit Only Granted for: ENCH620 or CHBE620.
Formerly: ENCH620.

CHBE630 Transport Phenomena (3 Credits)
Heat, mass and momentum transfer theory from the viewpoint of the basic transport equations. Steady and unsteady state; laminar and turbulent flow; boundary layer theory, mechanics of turbulent transport; with specific application to complex chemical engineering situations.
Prerequisite: CHBE422; and ENCH424. Or students who have taken courses with comparable content may contact the department.
Restriction: Permission of ENGR-Chemical & Biomolecular Engineering department.
Credit Only Granted for: ENCH630 or CHBE630.
Formerly: ENCH630.

CHBE640 Advanced Chemical Reaction Kinetics (3 Credits)
The theory and application of chemical reaction kinetics to reactor design. Reaction rate theory; homogeneous batch and flow reactors; fundamentals of catalysis; design of heterogeneous flow reactors.
Prerequisite: CHBE440; or students who have taken courses with comparable content may contact the department.
Restriction: Permission of ENGR-Chemical & Biomolecular Engineering department.
Credit Only Granted for: ENCH640 or CHBE640.
Formerly: ENCH640.

CHBE648 Special Problems in Chemical Engineering (1-12 Credits)
Research project under the direction of a faculty member.
Repeatable to: 12 credits.
Formerly: ENCH648.

CHBE651 Photovoltaics: Solar Energy (3 Credits)
The emphasis of the class is on developing a conceptual understanding of the device physics and manufacturing processes of crystalline and thin-film photovoltaic cells, and to develop elementary computational skills necessary to quantify solar cell efficiency. The class material includes detailed, system-level energy balances necessary to understand how solar energy fits into the complete energy generation, conversion, and storage picture. Quantitative comparisons of PV technology to solar chemical conversion processes and biofuels are made.
Jointly offered with: CHBE451.
Restriction: Permission of ENGR-Chemical & Biomolecular Engineering department.
Credit Only Granted for: CHBE451 or CHBE651.

CHBE652 Introduction of Machine Learning in Chemical Engineering (3 Credits)
Introduction of data science and machine learning approaches to modern problems in chemical engineering and materials science. This course develops data science approaches, including their foundational mathematical and statistical basis, and applies these methods to data sets of limited size and precision. Methods for regression and clustering will be developed and applied, with an emphasis on validation and error quantification. Techniques that will be developed include linear and nonlinear regression, clustering and logistic regression, dimensionality reduction, unsupervised learning, and artificial neural networks. These methods will be applied to a range of engineering problems, including conducting polymers, stretchable conductors, organic synthesis, and quality control in manufacturing.
Recommended: Basic knowledge of chemical engineering, materials science, ordinary differential equations, and Python is desirable.
Jointly offered with: CHBE452.
Restriction: Permission of Department or Instructor.
Credit Only Granted for: CHBE452 or CHBE652.

CHBE670 Colloid and Interface Science (3 Credits)
Introduction to colloidal systems and interfacial science. Topics include preparation, stability and coagulation kinetics of colloidal suspensions. Introduction to DLVO theory, electrokinetic phenomena, colloidal aggregation, interfacial phenomena, double layer theory, surface chemistry. Discussion of interfacial thermodynamics and interfacial forces for solid-liquid interfaces. Applications to nanomaterial synthesis, nanomaterial and polymer self-assembly, protein-protein interactions, and protein aggregation will be discussed.
Jointly offered with: CHBE470.
Restriction: Permission of ENGR-Chemical & Biomolecular Engineering department.
Credit Only Granted for: ENCH648F, CHBE470 or CHBE670.
Formerly: ENCH648F.

CHBE672 Control of Air Pollution Sources (3 Credits)
Sources and effects of air pollutants, regulatory trends, atmospheric dispersion models, fundamentals of two-phase flow as applied to air pollution and air pollution control systems, design of systems for control of gases and particulate matter.
Jointly offered with: CHBE472.
Restriction: Permission of ENGR-Chemical & Biomolecular Engineering department.
Credit Only Granted for: CHBE472 or CHBE672.

CHBE673 Advanced Batteries and Fuel Cells (3 Credits)
Basic electrochemical thermodynamics and kinetics, with emphasis on electrochemical techniques, fundamental principle and performance of batteries, and supercapacitors.
Jointly offered with: CHBE473.
Restriction: Permission of ENGR-Chemical & Biomolecular Engineering department.
Credit Only Granted for: CHBE473 or CHBE673.

CHBE674 Biopharmaceutical Process Development and Manufacturing (3 Credits)
Covers the fundamental steps involved in process development and manufacturing of biopharmaceuticals. An overview of different classes of biopharmaceuticals as well as manufacturing requirements for clinical development and regulatory approval will be provided. In depth coverage of manufacturing steps including cell culture, purification and formulation as well as drug product manufacturing, analysis and stability will be covered. Scientific literature will be used to highlight current challenges and novel solutions in each step of the manufacturing process. Scale up considerations, GMP requirements and process economics will also be introduced.
Jointly offered with: CHBE474.
Restriction: Permission of ENGR-Chemical & Biomolecular Engineering department.
Credit Only Granted for: CHBE474, BIOE489T, ENCH648D or CHBE674.
Formerly: ENCH648D.

CHBE676 Molecular Modeling Methods (3 Credits)
Statistical mechanics will be introduced to give the fundamental background for atomic to mesoscale molecular modeling. Classical atomic-level simulations methods (Monte Carlo and Molecular Dynamics) and the procedures to develop intra- and intermolecular potentials will be covered. This course will also discuss the theory and application of coarse-grained molecular simulations, mesoscale simulations and other modern simulation techniques. A broad range of applications will be included throughout the semester, e.g., phase behavior of small molecules, kinetics, and biophysics.
Jointly offered with: CHBE476.
Restriction: Permission of ENGR-Chemical & Biomolecular Engineering department.
Credit Only Granted for: CHBE476 or CHBE676.

CHBE677 Mesoscopic and Nanoscale Thermodynamics (3 Credits)
New emerging technologies deal with bio-membrane and gene engineering, microreactor chemistry and microcapsule drug delivery, micro-fluids and porous media, nanoparticles and nanostructures, supercritical fluid extraction and artificial organs. Engineers often design processes where classical thermodynamics may be insufficient, e.g., strongly fluctuating and nanoscale systems, or dissipative systems under conditions far away from equilibrium.
Prerequisite: A prior course in classical thermodynamics.
Jointly offered with: CHBE477.
Restriction: Permission of ENGR-Chemical & Biomolecular Engineering department.
Credit Only Granted for: CHBE477 or CHBE677.

CHBE680 Bionanotechnology: Physical Principles (3 Credits)
Physics at nano/micro scales. Biomolecular building blocks. Simplest biomolecular assembly: protein folding. Nanoscale intermolecular interactions important in biology. Protein-ligand binding. Protein higher-order assembly: filaments, networks. Protein filaments and motility. DNA, RNA and their assembly assisted by proteins. Viral capsid assembly. Lipid assembly into micelles, bilayers. Lipid-protein co-assembly in membranes. Lipid and polymer-based carriers useful in medicine. Antimicrobial therapies. Targeted cancer therapy. Ideal properties of nanocarriers in terms of size, charge, and surface chemistry.
Jointly offered with: CHBE480.
Restriction: Permission of ENGR-Chemical & Biomolecular Engineering department.
Credit Only Granted for: ENCH648N, CHBE480 or CHBE680.
Formerly: ENCH648N.

CHBE681 Transport Phenomena in Small and Biological Systems (3 Credits)
Familiarize students with the fundamental physics and modeling of transport phenomena in small and biological systems, and their current scientific and engineering utilization in microfluidics, nanofluidics and biological systems.
Jointly offered with: CHBE481.
Restriction: Permission of ENGR-Chemical & Biomolecular Engineering department.
Credit Only Granted for: CHBE481 or CHBE681.

CHBE684 Metabolic Pathway Engineering (3 Credits)
A focus on the analysis and engineering of metabolic pathways through (chemical) engineering principles, will be covered. Topics covered include: overview of biochemistry and metabolism; metabolic flux analysis and isotope labeling illustrated with examples from the recent scientific literature; technologies for engineering metabolic pathways; metabolic control analysis and pathway regulation; applications of metabolic engineering to synthesis of biofuels and therapeutics; specialized and related subjects such as protein engineering and synthetic biology.
Jointly offered with: CHBE484.
Restriction: Permission of ENGR-Chemical & Biomolecular Engineering department.
Credit Only Granted for: CHBE484 or CHBE684.

CHBE686 Advanced Heterogeneous Catalysis for Energy Applications (3 Credits)
Introduction to heterogeneous catalytic science and technology for energy conversion and hydocarbon processing. Preparation and mechanistic characterization of catalyst systems, kinetics of catalyzed reactions, adsorption and diffusion influences in heterogenious reactions. An overview of heterogeneous catalysis in various energy-related applications, including petroleum refining, chemicals from biomass, valorization of shale gas, and CO2 utilization will be introduced.
Prerequisite: Minimum grade of C- in CHBE302, CHBE424, and CHBE440; and permission of instructor.
Jointly offered with: CHBE486.
Restriction: Permission of instructor.
Credit Only Granted for: CHBE486, ENCH686 or CHBE686.
Formerly: ENCH686.

CHBE690 Polymer Reaction Engineering (3 Credits)
Advanced topics in polymerization kinetics, reactor design and analysis; addition and step-growth polymerization; homogeneous and heterogeneous polymerization; photopolymerization; reactor dynamics; optimal operation and control of industrial polymerization reactors.
Prerequisite: ENCH640; or permission of instructor.
Credit Only Granted for: ENCH781 or CHBE690.
Formerly: ENCH781.

CHBE691 Electrochemical Energy Engineering (3 Credits)
Introduces students to the fundamentals of electrochemical engineering, covering thermodynamics, kinetics, and transport in electrochemical cells, as well as electrode structures and electroanalytical techniques. The course will next transition to focus on electrochemical devices, including batteries, fuel cells, and other devices as guided by student input. This course will serve as a foundation for students who are interested in becoming practicing electrochemical engineers, those who would like to pursue research careers, and those who wish to become familiar with a specialized area within engineering that will have a crucial and growing importance during their careers.
Prerequisite: CHBE302, CHBE440, and CHBE422.
Jointly offered with: CHBE491.
Restriction: Permission of ENGR - Chemical & Biomolecular Engineering Department.
Credit Only Granted for: CHBE491 or CHBE691.

CHBE693 Chemical Processes in Beer Brewing (3 Credits)
Covers chemical engineering principles and chemical processes involved in the brewing and quality control of beer. Topics will include extraction and isomerization of bittering compounds from hops, enzymatic reactions involved in mashing beer, colloidal chemistry of haze formation, and microbiology of yeast and fermentation. Quantitative models will be applied to these processes based on fundamental chemical engineering principles from reaction kinetics, thermodynamics, transport phenomena, and colloid and interfacial science.
Prerequisite: Minimum grade of C- in CHBE424 and CHBE440; and permission of instructor.
Jointly offered with: CHBE493.
Restriction: Must be in a major within the ENGR-Chemical & Biomolecular Engineering department; and permission of ENGR- & Biomolecular Engineering department.
Credit Only Granted for: CHBE493 or CHBE693.
Additional Information: Neither the students nor the instructor will be making or working with alcoholic beverages in the course.

CHBE694 Sustainable Separations and Carbon Capture (3 Credits)
Provides a comprehensive overview of sustainable separations and carbon dioxide capture using synthetic membranes and sorbents.
Prerequisite: Minimum grade of C- in CHBE424, CHBE426 and CHBE440; and permission of instructor.
Jointly offered with: CHBE494.
Restriction: Must be in a major within the ENGR-Chemical & Biomolecular Engineering department; and must have permission of ENGR- & Biomolecular Engineering department.
Credit Only Granted for: CHBE494 or CHBE694.

CHBE697 Protein Engineering (3 Credits)
Covers the fundamentals of protein engineering and its applications in medicine, chemical processes, and energy. Topics will include the structure and function of biological molecules, rational design and directed evolution, construction of protein and peptide libraries, protein screening platforms, methods for characterizing structure and function of biological molecules. Scientific literature will be used to highlight key discoveries and current work in protein engineering.
Cross-listed with: BIPH697.
Jointly offered with: CHBE497.
Restriction: Permission of ENGR-Chemical & Biomolecular Engineering department.
Credit Only Granted for: CHBE497, BIOE489R, BIPH697, ENCH648P or CHBE697.
Formerly: ENCH648P.

CHBE799 Master's Thesis Research (1-6 Credits)
Repeatable to: 18 credits.

CHBE898 Pre-Candidacy Research (1-8 Credits)
Repeatable to: 18 credits.

CHBE899 Doctoral Dissertation Research (1-8 Credits)
Repeatable to: 18 credits.

CHEM - Chemistry

CHEM401 Inorganic Chemistry (3 Credits)
An overview of basic concepts of the electronic structure of the elements, chemical bonding and reactivity, from simple diatomic molecules to coordination compounds. These are viewed from simple (Lewis) to the most comprehensive molecular orbital theory. Symmetry and group theory are used throughout the course.
Prerequisite: CHEM276 or CHEM271; and (CHEM247 or CHEM241).

CHEM403 Radiochemistry (3 Credits)
Radioactive decay; introduction to properties of atomic nuclei; nuclear processes in cosmology; chemical, biomedical and environmental applications of radioactivity; nuclear processes as chemical tools; interaction of radiation with matter.
Prerequisite: Must have completed one year of college chemistry and one year of college physics.

CHEM425 Instrumental Methods of Analysis (4 Credits)
Modern instrumentation in analytical chemistry. Electronics, spectroscopy, chromatography and electrochemistry.
Prerequisite: CHEM272 and CHEM271; or (CHEM276 and CHEM277).

CHEM433 Atmospheric Chemistry and Climate (3 Credits)
The effects of human activity on atmospheric composition, focused on global warming, the carbon cycle, air pollution, and the ozone layer. Fundamentals of atmosphereic chemistry (spectroscopy, kinetics, isotopic analysis, and biogeochemical cycles) are related to the modern understanding of climate change, air quality, and ozone depletion, based on resources such as satellite missions, field campaigns, and scientific assessments published by international agencies. We also examine how society's energy needs could be met, in the future, in a manner with less impact on atmospheric composition than the present heavy reliance on combusion of fossil fuels.
Prerequisite: CHEM131, CHEM135, or CHEM146. And MATH241; or permission of CMNS-Atmospheric & Oceanic Science department; or permission of CMNS-Chemistry & Biochemistry department. Cross-listed with AOSC433.
Credit Only Granted for: AOSC433, AOSC633, CHEM433, or CHEM633.
Formerly: CHEM434.

CHEM441 Advanced Organic Chemistry (3 Credits)
An advanced study of the compounds of carbon, with special emphasis on molecular orbital theory and organic reaction mechanisms.
Prerequisite: Must have completed or be concurrently enrolled in CHEM480 or CHEM481; and 1 course with a minimum grade of C- from (CHEM241, CHEM247).
Jointly offered with: CHEM641.

CHEM460 Structure Determination Using Spectroscopic Methods (3 Credits)
The use of infrared, ultraviolet-visible, proton and carbon-13 nuclear magnetic resonance and mass spectroscopy for structure determination in organic chemistry.
Prerequisite: Must have completed CHEM243; or CHEM247; or (CHEM241 and CHEM242).
Formerly: CHEM660.

CHEM471 Techniques in Pulse NMR (1 Credit)
NMR techniques to operate, adjust, and calibrate the spectrometers and acquire and process NMR data in one and two dimensional NMR applications.
Prerequisite: CHEM241 and CHEM242; or CHEM247.
Recommended: CHEM460.
Restriction: Senior standing or higher.
Additional Information: Persons with heart pacemakers and/or metal implants cannot take the course due to potential health hazards.

CHEM480 Principles of Physical Chemistry (3 Credits)
Covers elementary thermodynamics, principles of kinetics and catalysis and selected topics in molecular quantum mechanics, spectroscopy and statistical mechanics. Topics will emphasize core subjects along with applications to biosciences, materials science, environmental science and related areas.
Prerequisite: (CHEM276 or CHEM271); and (CHEM277 or CHEM272); and (MATH140 or MATH136); and (PHYS260 and PHYS261) or PHYS132.
Credit Only Granted for: CHEM480 or CHEM481; CHEM480, BCHM485 or CHEM482.

CHEM481 Physical Chemistry I (3 Credits)
Thermodynamics and kinetics of chemical and molecular systems. Topics may include internal energy, heat, work, enthalpy, entropy, free energy, and spontaneity as well as reaction order, differential rate laws, integrated rate laws, and rate laws for multi-step processes.
Prerequisite: Minimum grade of C- in CHEM135; or minimum grade of C- in CHEM271 and CHEM272; or minimum grade of C- in CHEM276 and CHEM277. And minimum grade of C- in MATH141. And minimum grade of C- in PHYS260 and PHYS261; or minimum grade of C- in PHYS142.
Credit Only Granted for: CHEM481 or CHEM480.

CHEM482 Physical Chemistry II (3 Credits)
Quantum mechanical nature of atoms and molecules. Topics may include model systems for electronic, vibrational, rotational and translational energies as well as connections to molecular spectroscopy and thermal distributions.
Prerequisite: Minimum grade of C- in CHEM135; or minimum grade of C- in CHEM271 and CHEM272; or minimum grade of C- in CHEM276 and CHEM277. And minimum grade of C- in MATH141. And minimum grade of C- in PHYS260 and PHYS261; or minimum grade of C- in PHYS142.
Credit Only Granted for: CHEM482, BCHM485 or CHEM480.

CHEM483 Physical Chemistry Laboratory I (2 Credits)
An introduction to the principles and application of quantitative techniques in physical chemical measurements. Experiments will be coordinated with topics in CHEM481.
Prerequisite: Must have completed or be concurrently enrolled in CHEM481.

CHEM484 Physical Chemistry Laboratory II (2 Credits)
Advanced quantitative techniques necessary in physical chemical measurements. Experiments will be coordinated with topics in CHEM 482.
Prerequisite: Must have completed or be concurrently enrolled in CHEM482.

CHEM498 Special Topics in Chemistry (3 Credits)
Prerequisite: Prerequisite varies with the nature of the topic being considered.

CHEM601 Structure and Bonding of Molecules and Materials (3 Credits)
Development of the tools necessary to use the knowledge of structure and bonding of molecules and solids in the practice of synthetic inorganic and materials chemistry. Several bonding models are covered, from the simple valence bond and ligand field models to a quantitative group theoretical treatment of molecular orbital theory and band structure descriptions of solids. Concepts of electron counting and oxidation state and ligand characteristics are revisited in terms of the more sophisticated bonding models. Finally, these models are used to analyze the reactivity, magnetic and spectroscopic properties of inorganic coordination compounds. Prior advanced inorganic and/or advanced quantum chemistry courses are not prerequisites.

CHEM602 Advanced Inorganic Chemistry II (3 Credits)
A continuation of CHEM 601 with emphasis on the application of contemporary spectroscopic techniques to inorganic problems.
Prerequisite: CHEM601; or permission of instructor.

CHEM608 Selected Topics in Inorganic Chemistry (1-3 Credits)
Topics of special interest and current importance.
Prerequisite: CHEM602 and CHEM601; or students who have taken courses with comparable content may contact the department.
Repeatable to: 6 credits if content differs.

CHEM611 Professional Skills for New Graduate Students (1 Credit)
Covers a wide range of topics in professional development for new graduate students.
Restriction: Must be in one of the following programs (Chemistry (Master's); Biochemistry (Master's); Biochemistry (Doctoral); Chemistry (Doctoral)) ; and must be a new graduate student.

CHEM612 Scientific Presentations (1 Credit)
Workshops will cover all aspects of giving scientific presentations. Each student will give a presentation based oon the topic of his/her final paper in CHEM611. Presentations will be critiqued by peers and faculty members.
Prerequisite: CHEM611.

CHEM623 Optical Methods of Quantitative Analysis (3 Credits)
The quantitative applications of various methods of optical spectroscopy.
Prerequisite: CHEM482; or students who have taken courses with comparable content may contact the department.

CHEM624 Electrical Methods of Quantitative Analysis (3 Credits)
The use of conductivity, potentiometry, polarography, voltammetry, amperometry, coulometry, and chronopotentiometry in quantitative analysis.
Prerequisite: CHEM482; or students who have taken courses with comparable content may contact the department.

CHEM625 Separation Methods in Quantitative Analysis (3 Credits)
The theory and application for quantitative analysis of various forms of chromatography, ion exchange, solvent extraction, distillation, and mass spectroscopy.
Prerequisite: CHEM482; or students who have taken courses with comparable content may contact the department.

CHEM633 Atmospheric Chemistry and Climate (3 Credits)
The effects of human activity on atmospheric composition, focused on global warming, the carbon cycle, air pollution, and the ozone layer. Fundamentals of atmosphereic chemistry (spectroscopy, kinetics, isotopic analysis, and biogeochemical cycles) are related to the modern understanding of climate change, air quality, and ozone depletion, based on resources such as satellite missions, field campaigns, and scientific assessments published by international agencies. We also examine how society's energy needs could be met, in the future, in a manner with less impact on atmospheric composition than the present heavy reliance on combusion of fossil fuels.
Prerequisite: CHEM131, CHEM135, or CHEM146.
Cross-listed with: AOSC633.
Credit Only Granted for: AOSC433, AOSC633, CHEM433, or CHEM633.

CHEM640 Problems in Organic Reaction Mechanisms (1 Credit)
A tutorial type course dealing with the basic description of the fundamentals of writing organic reaction mechanisms.

CHEM641 Organic Reaction Mechanisms (3 Credits)
Jointly offered with CHEM441.

CHEM647 Organic Synthesis (3 Credits)
The use of new reagents in organic reactions; multistep syntheses leading to natural products of biological interest; stereospecific and regiospecific reactions and their use in total synthesis.

CHEM648 Special Topics in Organic Chemistry (1-3 Credits)
Topics of special interest and current importance.
Repeatable to: 9 credits if content differs.

CHEM650 Problems in Organic Synthesis (1 Credit)
A tutorial type course dealing with mechanistic problems from the current literature of organic sysnthesis.

CHEM678 Special Topics in Environmental Chemistry (3 Credits)
In-depth treatment of environmental chemistry problem areas of current research interest. The topics will vary somewhat from year to year.
Prerequisite: CHEM474.
Repeatable to: 6 credits if content differs.

CHEM682 Chemical Kinetics and Dynamics (3 Credits)
The dynamics of atoms and molecules as they undergo chemical and physical change. Topics will be developed from a fundamental perspective and modern applications will be discussed. Topics include: chemical kinetics rate equations, atomic and molecular collisions; rate theories; atomic, molecular and chemical lasers; control of matter with light.
Prerequisite: CHEM482; or permission of instructor.
Restriction: Restricted to graduate students or advanced undergraduates with prerequisites.

CHEM684 Chemical Thermodynamics (3 Credits)
Prerequisite: CHEM482; or students who have taken courses with comparable content may contact the department.

CHEM687 Statistical Mechanics and Chemistry (3 Credits)
Prerequisite: CHEM684; or students who have taken courses with comparable content may contact the department.

CHEM688 Selected Topics in Physical Chemistry (2 Credits)
Repeatable to: 6 credits if content differs.

CHEM689 Special Topics in Physical Chemistry (3 Credits)
Repeatable to: 9 credits if content differs.

CHEM690 Quantum Chemistry I (3 Credits)

CHEM698 Literature Seminar in Chemistry (1 Credit)
Students will prepare and present a departmental seminar baseed on a topic in the current research literature.
Restriction: Must be in a major within CMNS-Chemistry & Biochemistry department.

CHEM699 Special Problems in Chemistry (1-6 Credits)
Laboratory experience in a research environment.
Prerequisite: One semester of graduate study in chemistry.
Restriction: Restricted to students in the non-thesis M.S. option.
Repeatable to: 6 credits.

CHEM703 Introduction to Nonequilibrium Statistical Physics (3 Credits)
Analysis and microscopic modeling of systems away from thermal equilibrium. Linear response theory, ergodicity, Brownian motion, Monte Carlo modeling, thermal ratchets, far-from-equilibrium fluctuation relations. Introduction to the theoretical tools of nonequilibrium phenomena and their application to problems in physics, chemistry and biology.
Prerequisite: PHYS603 or CHEM687; or permission of instructor.
Cross-listed with: BIPH703, CHPH703, PHYS703.
Credit Only Granted for: BIPH703, CHEM703, CHPH703, or PHYS703.

CHEM705 Nuclear Chemistry (3 Credits)
Nuclear structure models, radioactive decay processes, nuclear reactions in complex nuclei, fission, nucleosynthesis and nuclear particle accelerators.

CHEM729 Special Topics in Geochemistry (1-3 Credits)
A discussion of current research problems.
Repeatable to: 6 credits if content differs.

CHEM799 Master's Thesis Research (1-6 Credits)

CHEM889 Seminar (1 Credit)

CHEM898 Pre-Candidacy Research (1-8 Credits)

CHEM899 Doctoral Dissertation Research (1-8 Credits)

CHIN - Chinese

CHIN401 Readings in Modern Chinese I (3 Credits)
Readings in history, politics, economics, sociology, and literature. Emphasis on wide-ranging, rapid reading, reinforced by conversations and compositions.
Prerequisite: CHIN302; or students who have taken courses with comparable content may contact the department. And must have taken a placement interview offered by the department for Non-majors.

CHIN402 Readings in Modern Chinese II (3 Credits)
Continuation of CHIN401.
Prerequisite: CHIN401; or students who have taken courses with comparable content may contact the department. And must have taken a placement interview offered by the department for Non-majors.

CHIN403 Classical Chinese I (3 Credits)
Close readings and discussion of literary, philosophical and historical texts in the original language. The course situates texts in their historical context and also discusses differences between classical and modern Chinese.
Prerequisite: CHIN302 or CHIN306; or permission of instructor.
Additional Information: Texts in Chinese. Class discussion and course work mainly in English.

CHIN408 Selected Readings in Classical Chinese (3 Credits)
Selected readings in Classical Chinese, including important representative works of history, poetry, and parallel prose. Close attention is paid to matters of grammar and phonology in the readings. Content will differ each time this course is offered.
Prerequisite: CHIN321; and must have knowledge of Pinyin.
Repeatable to: 9 credits if content differs.

CHIN411 Business Chinese I (3 Credits)
Conversation, reading, and writing applicable to Chinese business transactions, social meetings, and meetings with government organizations, plus background material in English on professional business practices and social customs associated with business.
Prerequisite: CHIN402; or permission of ARHU-School of Languages, Literatures, and Cultures department. And must have taken a placement interview offered by the department for Non-majors.

CHIN415 Readings in Current Newspapers and Periodicals (3 Credits)
Reading of periodical literature on selected topics with discussions and essays in Chinese.
Prerequisite: CHIN402; or students who have taken courses with comparable content may contact the department. And must have taken a placement interview offered by the department for Non-majors.

CHIN418 Special Topics in Contemporary Chinese Fiction and Film (3 Credits)
Various approaches to the most recent textual productions of China and Taiwan. Taught in Chinese.
Prerequisite: Permission of ARHU-School of Languages, Literatures, and Cultures department.
Repeatable to: 12 credits if content differs.

CHIN425 Ethnic and Cultural Diversity in China (3 Credits)
This course looks into ethnic and cultural diversity in China. It examines the evolution of the People's Republic of China's (PRC) ethnic policies in relation to nation-state building over the last six decades. Specifically, it studies how the PRC has categorized the Chinese people into 56 ethnic groups, how it has made affirmative action policies to accommodate ethnic diversity, and what problems its approaches have experienced and what solutions it has proposed in its accommodation of ethnicity and diversity in the 21st century. To examine the above issues, the course introduces and applies the concepts of ethnicity, nationality, ethnic nationalism, civic nationalism, identity, social Darwinism, the Soviet model of multinational state building, the Chinese model of inclusive Chinese nation state building, citizenship, individual rights, group rights, equality, and diversity.
Recommended: Any CHIN course or course on China.

CHIN428 Selected Topics in Chinese Linguistics (3 Credits)
Undergraduate seminar in Chinese linguistics. Topics may include the ancient writing system, historical phonology, dialectology, prosody and rhyming, grammar and the history of the language as a whole. This course may be repeated with different content, and satisfies the linguistics requirement for the Chinese major. Students are expected to be in at least Third Year Chinese. Taught in English.
Prerequisite: Permission of ARHU-School of Languages, Literatures, and Cultures department.
Restriction: Sophomore standing or higher.
Repeatable to: 12 credits if content differs.

CHIN429 Selected Topics in Chinese Studies (3 Credits)
In-depth study of a particular aspect of Chinese cultural, linguistic, literary studies. Specific topic to be announced when course is offered. Taught in English.
Prerequisite: CHIN315.
Repeatable to: 6 credits if content differs.

CHIN441 Traditional Chinese Fiction (3 Credits)
Major works of fiction from the 4th century tales of the marvelous through the 19th century Qing novel. Readings are in classical Chinese and English. Designed for students with advanced language skills. Taught in English.
Prerequisite: Permission of ARHU-School of Languages, Literatures, and Cultures department.

CHIN443 Cultural Histories of Medicine in China (3 Credits)
Investigates medical knowledge through traditional Chinese approaches to the body and beliefs about healing, including acupuncture, herbal medicine, prayer, ritual and folk medicine. Taught in English.
Restriction: Permission of department, School of Languages, Literatures and Cultures.

CHIN499 Directed Study in Chinese (1-3 Credits)
Readings in Chinese under faculty supervision.
Prerequisite: Permission of instructor.
Repeatable to: 6 credits if content differs.

CHIN602 The Language of Contemporary Chinese Audio Media (3 Credits)
Oral Chinese non-fiction in the high diglossic register, with emphasis on contextually and culturally appropriate interpretation of lexicon, style, and idiom. Conducted entirely in Chinese, intended for non-native speakers of the language pursuing professional levels of competence.
Prerequisite: Must have taken a placement test offered by the department.

CHIN603 The Language of Contemporary Chinese Written Fiction (3 Credits)
Chinese fiction writing, with emphasis on contextually and culturally appropriate interpretation of lexicon, style, and idiom in various genres. Conducted entirely in Chinese; intended for non-native speakers of the language pursuing professional levels of competence.
Prerequisite: Must have taken a placement test offered by the department.

CHIN611 Structure of the Chinese Language (3 Credits)
An overview of the basic linguistic characteristics of modern standard (Mandarin) Chinese, including phonology, morphology and syntax. Emphasis on the analysis of functional linguistic models and the development of student skills in critically appraising existing interpretations of Chinese language structure.

CHIN621 Chinese Historical Linguistics (3 Credits)
An introduction to the origin and development of the Chinese language, and its relationship to other languages.

CHPH - Chemical Physics

CHPH618 Special Projects in Chemical Physics (1-3 Credits)
Independent reading and study covering chemical physics subject areas not available in other courses.
Restriction: Permission of instructor.
Repeatable to: 6 credits.

CHPH633 Advanced Characterization of Soft Matter Materials (3 Credits)
This course is focused on both the theories and experimental works of studying structure and dynamics of soft matter materials using scattering techniques (light, x-ray and neutron scattering). These scattering techniques can probe the structure from a few Angstrom to micrometer and the dynamics from picosecond to second, are thus widely used to reveal the structure-performance relationship of different materials. The course discusses the physics principles of these techniques and explains the details of general theories and commonly used models in characterizing soft matter materials such as polymer, protein, colloidal, thin film, and gel systems.
Cross-listed with: ENMA633.
Restriction: Permission of ENGR-Materials Science & Engineering department.
Credit Only Granted for: ENMA633 or CHPH633.

CHPH703 Introduction to Nonequilibrium Statistical Physics (3 Credits)
Analysis and microscopic modeling of systems away from thermal equilibrium. Linear response theory, ergodicity, Brownian motion, Monte Carlo modeling, thermal ratchets, far-from-equilibrium fluctuation relations. Introduction to the theoretical tools of nonequilibrium phenomena and their application to problems in physics, chemistry and biology.
Prerequisite: PHYS603 or CHEM687; or permission of instructor.
Cross-listed with: CHEM703, BIPH703, PHYS703.
Credit Only Granted for: BIPH703, CHEM703, CHPH703, or PHYS703.

CHPH709 Seminar in Chemical Physics (1 Credit)
Current research and developments in chemical physics.

CHPH718 Special Topics in Chemical Physics (1-3 Credits)
A discussion of current research problems in chemical physics.
Repeatable to: 99 credits if content differs.

CHPH799 Master's Thesis Research (1-6 Credits)

CHPH898 Pre-Candidacy Research (1-8 Credits)

CHPH899 Doctoral Dissertation Research (1-8 Credits)

CLAS - Classics

CLAS409 Classics Capstone Seminar (3 Credits)
Comparative study of selected central aspects of both ancient Greek and Roman cultures as viewed from the standpoints of literary study, history, art history, and other fields as appropriate. Seminar format involving intensive student research.
Restriction: Permission of ARHU-Classics department.
Repeatable to: 6 credits if content differs.

CLAS419 The Classical Tradition (3 Credits)
Examination of the role of Greek and Roman civilization in shaping the arts and ideas of western culture.
Repeatable to: 9 credits if content differs.
Credit Only Granted for: CLAS419 or CLAS420.
Formerly: CLAS420.

CLAS470 Approaches to Greek Mythology (3 Credits)
Ancient and modern approaches to understanding Greek myth as expression of human experience, including interpretations drawn from psychology, anthropology, and comparative mythology.
Prerequisite: CLAS170; or permission of ARHU-Classics department.

CLAS488 Independent Study in Classical Civilization (3 Credits)
Prerequisite: Permission of ARHU-Classics department.
Repeatable to: 6 credits if content differs.

CLAS499 Independent Study in Classical Languages and Literatures (1-3 Credits)
Prerequisite: Permission of ARHU-Classics department.

CLAS621 The Classical Tradition (3 Credits)
The role the classics have played in western thought, with particular attention to literature.

CLAS688 Special Topics in Classical Civilization (3 Credits)
Repeatable to: 9 credits if content differs.

CLAS699 Independent Study in Classical Civilization (1-3 Credits)
Restriction: Permission of instructor.
Repeatable to: 6 credits if content differs.

CLAS799 Master's Thesis Research (1-6 Credits)

CLFS - Chemical and Life Sciences

CLFS608 Seminar in Current Topics in Chemical and Life Science (1-4 Credits)
Seminar in current topics in the Life Sciences. Contact Program Director or instructor before registering.
Restriction: Must be in Master of Chemical & Life Sciences (Master's) program; and permission of CMNS-Chemical & Life Sciences department.
Repeatable to: 6 credits if content differs.
Formerly: LFSC608.

CLFS609 Special Topics (1-3 Credits)
Individual instruction course. Contact Program Director or instructor before registering.
Prerequisite: Two years of teaching experience; and CLFS510.
Restriction: Must be in Master of Chemical & Life Sciences (Master's) program; and permission of CMNS-Chemical & Life Sciences department.
Repeatable to: 6 credits if content differs.
Formerly: LFSC609.

CLFS610 Natural Products Chemistry (3 Credits)
Foundations of natural products chemistry; how nature goes about making (biosynthesizing) these compounds and elements of enzymology and genomics relevant to production of these compounds; relevance of natural products chemistry as a driving force for drug discovery and innovation in biotechnology.
Restriction: Permission of CMNS-Chemical & Life Sciences department.
Credit Only Granted for: LFSC609D or LFSC610.
Formerly: LFSC609D.

CLFS619 Special Topics in Chemistry (1-3 Credits)
Topics of current interest and special importance.
Repeatable to: 9 credits if content differs.
Formerly: LFSC619.

CLFS620 Modern Molecular Genetics (3 Credits)
An overview of genetics including the genetic basis/components in prevalent diseases, genetically engineered organisms and foods, the importance of knowing the complete DNA sequence of organisms.

CLFS630 Principles of Transmission Genetics: A Historical and Modern Perspective (3 Credits)
Examines the origins of modern genetics, model genetic systems, and the role of chromosomes in vertical transmission of genetic information from parent to offspring. Classical gene mapping, population genetics and the various applications of modern genetics will also be studied.

CLFS655 The Chemistry and Applications of Electrochemical Cells (3 Credits)
Chemistry of electrochemical cells including the thermodynamic basis for the production of electrical energy by cells, the chemical reactions utilized by the most common cells, the manufacture of cells, and the application of cells in energy production.

CLFS660 Biodiversity and Conservation Biology (3 Credits)
Application of ecological and evolutionary principles to assess the impact of the human species on the environment and its inhabitants. Specific case studies are included to illustrate problems of bidiversityloss and actions required to reverse the trends.

CLFS665 Ecology and Global Change (3 Credits)
Ecological concepts across scales ranging from the individual, to populations, communities, ecosystems, and landscapes will be presented. Global change issues will encompass alteration of atmospheric trace gases, biogeochemistry cycles, land use changes, and introduction of non-native species to new habitats.
Credit Only Granted for: LFSC609C or LFSC665.
Formerly: LFSC609C.

CLFS690 Biochemistry (3 Credits)
An advanced overview of general biochemistry including a study of protein structure and their physical properties; how these properties relate to catalysis, regulation of catalysis and metabolic chemistry with respect to their relationship to physiological conditions.

CLFS725 Experimental Design (2 Credits)
Experimental design and statistics for science teachers that emphasizes the underlying structure of data and how this affects the quality and reliability of experiments. Examines the nature of data, the methods for designing rigorous experiments, important experimental design formats, and the relationships between data structure and analysis. Course work focuses on the design and analysis of orginal experiments for a series of research problems.
Credit Only Granted for: LFSC710, LFSC719, or LFSC725.
Formerly: LFSC719.

500-level courses

CMLT - Comparative Literature

CMLT488 Genres (3 Credits)
A study of a recognized literary form, such as tragedy, film, satire, literary criticism, comedy, tragicomedy, etc.
Repeatable to: 6 credits if content differs.

CMLT498 Selected Topics in Comparative Studies (3 Credits)

CMLT639 Studies in the Renaissance (3 Credits)
Repeatable to: 9 credits.

CMLT649 Studies in Eighteenth Century Literature (3 Credits)
Studies in eighteenth century literature: as announced.
Repeatable to: 9 credits.

CMLT658 Studies in Romanticism (3 Credits)
Studies in romanticism: as announced.
Repeatable to: 9 credits.

CMLT679 Topics in Comparative Studies (3 Credits)
Seminar in modern and contemporary literature: as announced.
Repeatable to: 9 credits.

CMLT699 Independent Study (1-6 Credits)
Research and writing on specific readings on a topic selected by the student which is approved and supervised by a faculty member.
Restriction: Permission of instructor.
Repeatable to: 9 credits if content differs.

CMLT709 Seminar in Transnational Literatures and Cultures (3 Credits)
Examines cultural and political ideas as they circulate across nations in literary and/or other forms (film, song, visual culture, digital works, etc.) in both historical and modern-day contexts.
Cross-listed with: ENGL709.
Restriction: Permission of ARHU-English Department.
Repeatable to: 9 credits if content differs.

CMLT788 Practicum in Comparative Studies (1-6 Credits)
Practical professional training for individuals and groups of students in supervised settings.
Prerequisite: Permission of ARHU-English department.
Repeatable to: 20 credits if content differs.

CMLT799 Master's Thesis Research (1-6 Credits)

CMLT898 Pre-Candidacy Research (1-8 Credits)

CMLT899 Doctoral Dissertation Research (1-8 Credits)

CMSC - Computer Science

CMSC401 Algorithms for Geospatial Computing (3 Credits)
An introduction to fundamental geospatial objects and geometric algorithms for spatio-temporal data processing and analysis. Point data representation and analysis: spatial data models and data structures, algorithms for spatial queries, point clustering algorithms. Surface and scalar field modeling, such as terrains: raster and triangle-based models (TINs), algorithms for building and querying TINs. Algorithms for natural and urban terrain analysis: morphology computation and visibility analysis. Applications to processing and analysis of LiDAR (Light Detection And Ranging) data in the context of terrain reconstruction, urban modeling, forest management and bathymetry reconstruction for coastal data management. Road network computation and analysis: algorithms for route computation in road networks, and for road network reconstruction from GPS and satellite data.
Prerequisite: GEOG276; or a minimum grade of C- in CMSC330 and CMSC351; or permission of instructor.
Cross-listed with: GEOG470.
Jointly offered with: GEOG770.
Credit Only Granted for: CMSC498Q, CMSC401, CMSC788I, GEOG470, GEOG498I, GEOG770, or GEOG788I.
Formerly: GEOG498I.

CMSC411 Computer Systems Architecture (3 Credits)
Input/output processors and techniques. Intra-system communication, buses, caches. Addressing and memory hierarchies. Microprogramming, parallelism, and pipelining.
Prerequisite: Minimum grade of C- in CMSC330; or must be in the (Computer Science (Doctoral), Computer Science (Master's)) program.
Restriction: Permission of CMNS-Computer Science department.
Credit Only Granted for: ENEE446 or CMSC411.

CMSC412 Operating Systems (4 Credits)
A hands-on introduction to operating systems, including topics in: multiprogramming, communication and synchronization, memory management, IO subsystems, and resource scheduling polices. The laboratory component consists of constructing a small kernel, including functions for device IO, multi-tasking, and memory management.
Prerequisite: Minimum grade of C- in CMSC330 and CMSC351; and 1 course with a minimum grade of C- from (CMSC414, CMSC417, CMSC420, CMSC430, CMSC433, CMSC435, ENEE440, ENEE457).
Restriction: Permission of CMNS-Computer Science department; or must be in one of the following programs (Computer Science (Master's); Computer Science (Doctoral)).
Credit Only Granted for: CMSC412 or ENEE447.

CMSC414 Computer and Network Security (3 Credits)
An introduction to the topic of security in the context of computer systems and networks. Identify, analyze, and solve network-related security problems in computer systems. Fundamentals of number theory, authentication, and encryption technologies, as well as the practical problems that have to be solved in order to make those technologies workable in a networked environment, particularly in the wide-area Internet environment.
Prerequisite: Minimum grade of C- in CMSC330 and CMSC351; or must be in the (Computer Science (Doctoral), Computer Science (Master's)) program.
Restriction: Permission of CMNS-Computer Science department.
Credit Only Granted for: CMSC414 or ENEE457.

CMSC416 Introduction to Parallel Computing (3 Credits)
Introduction to parallel computing. Topics include programming for shared memory and distributed memory parallel architectures, and fundamental issues in design, development, and performance analysis of parallel programs.
Prerequisite: Minimum grade of C- in CMSC330 and CMSC351; or permission of instructor.
Jointly offered with: CMSC616.
Restriction: Permission of CMNS-Computer Science department.
Credit Only Granted for: CMSC416, CMSC498X, CMSC616, or CMSC818X.
Formerly: CMSC498X.

CMSC417 Computer Networks (3 Credits)
Computer networks and architectures. The OSI model including discussion and examples of various network layers. A general introduction to existing network protocols. Communication protocol specification, analysis, and testing.
Prerequisite: Minimum grade of C- in CMSC351 and CMSC330; and permission of CMNS-Computer Science department. Or must be in the (Computer Science (Doctoral), Computer Science (Master's)) program.

CMSC420 Advanced Data Structures (3 Credits)
Description, properties, and storage allocation functions of data structures including balanced binary trees, B-Trees, hash tables, skiplists, tries, KD-Trees and Quadtrees. Algorithms for manipulating structures. Applications from areas such as String Processing, Computer Graphics, Information Retrieval, Computer Networks, Computer Vision, and Operating Systems.
Prerequisite: Minimum grade of C- in CMSC351 and CMSC330; and permission of CMNS-Computer Science department. Or must be in the (Computer Science (Doctoral), Computer Science (Master's)) program.

CMSC421 Introduction to Artificial Intelligence (3 Credits)
Introduces a range of ideas and methods in AI, varying semester to semester but chosen largely from: automated heuristic search, planning, games, knowledge representation, logical and statistical inference, learning, natural language processing, vision, robotics, cognitive modeling, and intelligent agents. Programming projects will help students obtain a hands-on feel for various topics.
Prerequisite: Minimum grade of C- in CMSC351 and CMSC330; and permission of CMNS-Computer Science department. Or must be in the (Computer Science (Doctoral), Computer Science (Master's)) program.

CMSC422 Introduction to Machine Learning (3 Credits)
Machine Learning studies representations and algorithms that allow machines to improve their performance on a task from experience. This is a broad overview of existing methods for machine learning and an introduction to adaptive systems in general. Emphasis is given to practical aspects of machine learning and data mining.
Prerequisite: Minimum grade of C- in CMSC320, CMSC330, and CMSC351; and 1 course with a minimum grade of C- from (MATH240, MATH341, MATH461, ENEE290); and permission of CMNS-Computer Science department.

CMSC423 Computational Genomics (3 Credits)
Computers have revolutionized modern biological research by enabling the management and analysis of the large amounts of data generated through high-throughput experiments. This course provides insight into some of the biological problems that can be addressed using computational methods and introduces the main data structures and algorithms used to solve problems related to biological sequences such as DNA, RNA, and proteins. Many of the techniques taught in this course are applicable beyond the bioinformatics domain, as they are relevant to and commonly used in other areas of computer science. No knowledge of biology is required for this course.
Prerequisite: Minimum grade of C- in CMSC351 and CMSC330; and permission of CMNS-Computer Science department.

CMSC424 Database Design (3 Credits)
Students are introduced to database systems and motivates the database approach as a mechanism for modeling the real world. An in-depth coverage of the relational model, logical database design, query languages, and other database concepts including query optimization, concurrency control; transaction management, and log based crash recovery. Distributed and Web database architectures are also discussed.
Prerequisite: Minimum grade of C- in CMSC351 and CMSC330; and permission of CMNS-Computer Science department. Or must be in the (Computer Science (Doctoral), Computer Science (Master's)) program.

CMSC425 Game Programming (3 Credits)
An introduction to the principles and practice of computer game programming and design. This includes an introduction to game hardware and systems, the principles of game design, object and terrain modeling, game physics, artificial intelligence for games, networking for games, rendering and animation, and aural rendering. Course topics are reinforced through the design and implementation of a working computer game.
Prerequisite: Minimum grade of C- in CMSC330 and CMSC351.
Restriction: Permission of CMNS-Computer Science department.

CMSC426 Computer Vision (3 Credits)
An introduction to basic concepts and techniques in computervision. This includes low-level operations such as image filtering and edge detection, 3D reconstruction of scenes using stereo and structure from motion, and object detection, recognition and classification.
Prerequisite: Minimum grade of C- in CMSC330 and CMSC351 and 1 course with a minimum grade of C- from (MATH240, MATH341, MATH461, ENEE290); or must be in the (Computer Science (Doctoral), Computer Science (Master's)) program; or permission of the instructor.
Restriction: Permission of CMNS-Computer Science department.

CMSC427 Computer Graphics (3 Credits)
An introduction to 3D computer graphics, focusing on the underlying building blocks and algorithms for applications such as 3D computer games, and augmented and virtual reality (AR/VR). Covers the basics of 3D image generation and 3D modeling, with an emphasis on interactive applications. Discusses the representation of 3D geometry, 3D transformations, projections, rasterization, basics of color spaces, texturing and lighting models, as well as programming of modern Graphics Processing Units (GPUs). Includes programming projects where students build their own 3D rendering engine step-by-step.
Prerequisite: Minimum grade of C- in CMSC330 and CMSC351; 1 course with a minimum grade of C- from (MATH240, MATH341, MATH461, ENEE290).
Restriction: Permission of CMNS-Computer Science department.

CMSC430 Introduction to Compilers (3 Credits)
Topics include lexical analysis, parsing, intermediate representations, program analysis, optimization, and code generation.
Prerequisite: Minimum grade of C- in CMSC330 and CMSC351; and permission of CMNS-Computer Science department. Or must be in the (Computer Science (Doctoral), Computer Science (Master's)) program.

CMSC433 Programming Language Technologies and Paradigms (3 Credits)
Programming language technologies (e.g., object-oriented programming), their implementations and use in software design and implementation.
Prerequisite: Minimum grade of C- in CMSC330; or must be in the (Computer Science (Doctoral), Computer Science (Master's)) program.
Restriction: Permission of CMNS-Computer Science department.

CMSC434 Introduction to Human-Computer Interaction (3 Credits)
Assess usability by quantitative and qualitative methods. Conduct task analyses, usability tests, expert reviews, and continuing assessments of working products by interviews, surveys, and logging. Apply design processes and guidelines to develop professional quality user interfaces. Build low-fidelity paper mockups, and a high-fidelity prototype using contemporary tools such as graphic editors and a graphical programming environment (eg: Visual Basic, Java).
Prerequisite: Minimum grade of C- in CMSC330 and CMSC351; and permission of CMNS-Computer Science department. Or must be in the (Computer Science (Doctoral), Computer Science (Master's)) program.

CMSC435 Software Engineering (3 Credits)
State-of-the-art techniques in software design and development. Laboratory experience in applying the techniques covered. Structured design, structured programming, top-down design and development, segmentation and modularization techniques, iterative enhancement, design and code inspection techniques, correctness, and chief-programmer teams. The development of a large software project.
Prerequisite: 1 course with a minimum grade of C- from (CMSC412, CMSC417, CMSC420, CMSC430, CMSC433, ENEE447); and permission of CMNS-Computer Science department.

CMSC436 Programming Handheld Systems (3 Credits)
Fundamental principles and concepts that underlie the programming of handheld systems, such as mobile phones, personal digital assistants, and tablet computers. Particular emphasis will be placed on concepts such as limited display size, power, memory and CPU speed; and new input modalities, where handheld systems differ substantially from non-handheld systems, and thus require special programming tools and approaches. Students will apply these concepts and principles in the context of an existing handset programming platform.
Prerequisite: Minimum grade of C- in CMSC330 and CMSC351; or must be in the (Computer Science (Doctoral), Computer Science (Master's)) program.
Restriction: Permission of CMNS-Computer Science department.

CMSC437 Introduction to Quantum Software Laboratory (3 Credits)
Introductory Programming/Software laboratory for quantum computing. Understand the existing programming tools for quantum computers and the characteristics of quantum hardware. Develop quantum application prototypes and tools to characterize and mitigate the limitations of quantum hardware.
Prerequisite: Minimum grade of C- in CMSC457 or PHYS467; and familiarity with basic programming, languages (e.g., Python).
Restriction: Permission of CMNS-Computer Science department.

CMSC451 Design and Analysis of Computer Algorithms (3 Credits)
Fundamental techniques for designing efficient computer algorithms, proving their correctness, and analyzing their complexity. General topics include graph algorithms, basic algorithm design paradigms (such as greedy algorithms, divide-and-conquer, and dynamic programming), network flows, NP-completeness, and other selected topics in algorithms.
Prerequisite: Minimum grade of C- in CMSC351; and permission of CMNS-Computer Science department. Or must be in the (Computer Science (Doctoral), Computer Science (Master's)) program.

CMSC452 Elementary Theory of Computation (3 Credits)
Techniques are developed to determine the difficulty of a problem relative to a model of computation. Topics include Finite Automata, P, NP, decidability, undecidability, and communication complexity.
Prerequisite: Minimum grade of C- in CMSC351; and permission of CMNS-Computer Science department. Or must be in the (Computer Science (Doctoral), Computer Science (Master's)) program.

CMSC454 Algorithms for Data Science (3 Credits)
Fundamental methods for processing a high volume of data. Methods include stream processing, locally sensitive hashing, web search methods, page rank computation, network and link analysis, dynamic graph algorithms as well as methods to handle high dimensional data/dimensionality reduction.
Prerequisite: Minimum grade of C- in CMSC330 and CMSC351.
Restriction: Permission of CMSC-Computer Science department.

CMSC456 Cryptography (3 Credits)
The theory, application, and implementation of mathematical techniques used to secure modern communications. Topics include symmetric and public-key encryption, message integrity, hash functions, block-cipher design and analysis, number theory, and digital signatures.
Prerequisite: (CMSC106, CMSC131, or ENEE150; or equivalent programming experience); and (2 courses from (CMSC330, CMSC351, ENEE324, or ENEE382); or any one of these courses and a 400-level MATH course, or two 400-level MATH courses); and Permission of CMNS-Mathematics department or permission of instructor.
Cross-listed with: MATH456, ENEE456.
Credit Only Granted for: MATH456, CMSC456 or ENEE456.

CMSC457 Introduction to Quantum Computing (3 Credits)
An introduction to the concept of a quantum computer, including algorithms that outperform classical computation and methods for performing quantum computation reliably in the presence of noise. As this is a multidisciplinary subject, the course will cover basic concepts in theoretical computer science and physics in addition to introducing core quantum computing topics. No previous background in quantum mechanics is required.
Prerequisite: 1 course with a minimum grade of C- from (ENEE290, MATH240, MATH341, MATH461, MATH243); and 1 course with a minimum grade of C- from (CMSC351, PHYS313).
Cross-listed with: PHYS457.
Credit Only Granted for: CMSC457 or PHYS457.
Additional Information: Only Physics students may use MATH243 to satisfy the Linear Algebra prerequisite for CMSC/PHYS457.

CMSC460 Computational Methods (3 Credits)
Basic computational methods for interpolation, least squares, approximation, numerical quadrature, numerical solution of polynomial and transcendental equations, systems of linear equations and initial value problems for ordinary differential equations. Emphasis on methods and their computational properties rather than their analytic aspects. Intended primarily for students in the physical and engineering sciences.
Prerequisite: 1 course with a minimum grade of C- from (MATH240, MATH341, MATH461, ENEE290, MATH243); and 1 course with a minimum grade of C- from (MATH241, MATH340); and 1 course with a minimum grade of C- from (CMSC106, CMSC131); and 1 course with a minimum grade of C- from (MATH246, MATH341, ENEE290, MATH243).
Cross-listed with: AMSC460.
Credit Only Granted for: AMSC460, AMSC466, CMSC460, or CMSC466.

CMSC466 Introduction to Numerical Analysis I (3 Credits)
Floating point computations, direct methods for linear systems, interpolation, solution of nonlinear equations.
Prerequisite: 1 course with a minimum grade of C- from (CMSC106, CMSC131); and minimum grade of C- in MATH410.
Cross-listed with: AMSC466.
Credit Only Granted for: AMSC460, CMSC460, AMSC466, or CMSC466.

CMSC470 Introduction to Natural Language Processing (3 Credits)
Introduction to fundamental techniques for automatically processing and generating natural language with computers. Machine learning techniques, models, and algorithms that enable computers to deal with the ambiguity and implicit structure of natural language. Application of these techniques in a series of assignments designed to address a core application such as question answering or machine translation.
Prerequisite: Minimum grade of C- in CMSC320, CMSC330, and CMSC351; and 1 course with a minimum grade of C- from (MATH240, MATH341, MATH461, ENEE290).
Restriction: Permission of CMNS-Computer Science department.

CMSC471 Introduction to Data Visualization (3 Credits)
Datasets are becoming increasingly large and complex, requiring intuitive ways to explore and interpret them quickly and efficiently. In this case, a picture is worth a thousand words: visualizations enable us to transform data into images that are easier to understand and reason about, compared to raw numbers and raw text. Visualizations are critical tools in externalizing and organizing our knowledge and insights, whether to explore collected datasets to improve our understanding of the physical world, to assess and debug analysis/experimental workflows, or to present new and interesting results to diverse audiences. In this course we will study techniques and algorithms for creating effective visualizations based on principles from graphic design, perceptual psychology, and cognitive science. Students will learn how to design and build interactive visualizations for the web, using the D3.js (Data-Driven Documents) framework.
Prerequisite: Minimum grade of C- in CMSC330 and CMSC351; and permission of CMNS-Computer Science Department.
Restriction: Permission of the CMNS-Computer Science Department.
Credit Only Granted for: CMSC471 or CMSC498O.
Formerly: CMSC498O.

CMSC472 Introduction to Deep Learning (3 Credits)
An introduction to deep learning, a machine learning technique, as well as its applications to a variety of domains. Provides a broad overview of deep learning concepts including neural networks, convolutional neural networks, recurrent neural networks, generative models, and deep reinforcement learning, and an intuitive introduction to basics of machine learning such as simple models, learning paradigms, optimization, overfitting, importance of data, and training caveats.
Prerequisite: Minimum grade of C- or higher in CMSC330 and CMSC351; and 1 course with a minimum grade of C- or higher from (MATH240, MATH341, MATH461, ENEE290).
Restriction: Permission of the CMNS-Computer Science department. Or must be in the (Computer Science (Doctoral), Computer Science (Master's) program.

CMSC473 Capstone in Machine Learning (3 Credits)
Semester-long project course in which each student will identify and carry out a project related to machine learning, with the goal of publishing a research paper or software tool.
Prerequisite: Minimum grade of C- or higher in CMSC421 or CMSC422.
Recommended: Background or exposure to machine learning topics is strongly encouraged.
Restriction: Permission of instructor and Permission of CMSC - Computer Science department.
Credit Only Granted for: CMSC498P or CMSC473.
Formerly: CMSC498P.
Additional Information: Students will be paired with project advisors from the UMD faculty or alternatively, an industry advisor. Students are encouraged to plan for projects results that can be published at academic conferences or will impact academic research.

CMSC474 Introduction to Computational Game Theory (3 Credits)
Game theory deals with interactions among agents (either human or computerized) whose objectives and preferences may differ from the objectives and preferences of the other agents. It will also provide a comprehensive introduction to game theory, concentrating on its computational aspects.
Prerequisite: Minimum grade of C- in CMSC351 and CMSC330; and permission of CMNS-Computer Science department. Or must be in the (Computer Science (Doctoral), Computer Science (Master's)) program.
Credit Only Granted for: CMSC474, ECON414, GVPT390 or GVPT399A.

CMSC475 Combinatorics and Graph Theory (3 Credits)
General enumeration methods, difference equations, generating functions. Elements of graph theory, matrix representations of graphs, applications of graph theory to transport networks, matching theory and graphical algorithms.
Prerequisite: 1 course with a minimum grade of C- from (MATH240, MATH341, MATH461, ENEE290, MATH243); and 1 course with a minimum grade of C- from (MATH241, MATH340); and 1 course with a minimum grade of C- from (MATH310, CMSC250).
Cross-listed with: MATH475.
Credit Only Granted for: MATH475 or CMSC475.

CMSC477 Robotics Perception and Planning (3 Credits)
A hands-on introduction to perception and planning for robotics, including rigid body transformations and rotations, dynamics and control of mobile robots/drones, graph based and sampling based planning algorithms, Bayseian and Kalman filtering, camera models and calibration, projective geometry, visual features, optical flow, pose estimation, RANSAC and Hough transform, structure from motion, visual odometry, machine learning basics, visual recognition and learning.
Prerequisite: 1 course from (MATH240, MATH341, MATH461, ENEE290); and (ENEE467 or CMSC420).
Restriction: Must be in the Robotics and Autonomous Systems minor; and permission of Computer Science department.
Additional Information: Students in the Robotics and Autonomous Systems minor should take ENEE467 as a prerequisite; Computer Science students not in the minor should take CMSC420.

CMSC488 Special Topics in Computer Science (1-3 Credits)
Seminar courses that allow students to pursue new and emerging areas of Computer Science.
Restriction: Permission of CMNS-Computer Science department.
Repeatable to: 6 credits if content differs.
Additional Information: Course may be used as electives for the undergraduate degree and minor.

CMSC498 Selected Topics in Computer Science (1-3 Credits)
An individualized course designed to allow a student or students to pursue a selected topic not taught as a part of the regular course offerings under the supervision of a Computer Science faculty member. In addition, courses dealing with topics of special interest and/or new emerging areas of computer science will be offered with this number. Selected topics courses will be structured very much like a regular course with homework, project and exams. Credit according to work completed
Restriction: Permission of CMNS-Computer Science department.

CMSC499 Independent Undergraduate Research (1-3 Credits)
Students are provided with an opportunity to participate in a computer science research project under the guidance of a faculty advisor. Format varies. Students and supervising faculty member will agree to a research plan which must be approved by the department. As part of each research plan, students should produce a final paper delineating their contribution to the field.
Restriction: Must be in one of the following programs (Computer Science; Engineering: Computer) ; and permission of CMNS-Computer Science department.

CMSC601 Computational and Mathematical Analysis of Biological Networks across Scales (3 Credits)
Describe, implement and analyze algorithms that solve fundamental problems in biological network analysis: descriptive summaries of network structure and properties, probabilistic and dynamical network models, statistical models for networked data and network visualization.
Prerequisite: CMSC423; or equivalent.
Credit Only Granted for: CMSC828O or CMSC601.
Formerly: CMSC828O.

CMSC614 Computer and Network Security (3 Credits)
Advanced topics in computer and network security, including: anonymity, privacy, memory safety, malware, denial of service attacks, trusted hardware, security design principles, and empirically measuring security "in the wild". This will be a largely paper-driven course (there is no textbook), preparing students for research in (or around) the broad area of security. Students will gain first-hand experience launching attacks in controlled environments. The bulk of the grade will be based on a final, semester-long group project.
Recommended: Knowledge of C programming.
Restriction: Must be in the Computer Science Master's or Doctoral programs.
Credit Only Granted for: CMSC818O or CMSC614.
Formerly: CMSC818O.

CMSC616 Foundations of Parallel Computing (3 Credits)
Covers the foundations of parallel computing. Topics include programming for shared memory and distributed memory parallel architectures, and fundamental issues in design, development and analysis of parallel programs.
Prerequisite: CMSC411 and CMSC412; or permission of instructor.
Restriction: Must be in the Computer Science or Applied Mathematics and Scientific Computation master's or doctoral programs.
Credit Only Granted for: CMSC616 or CMSC818X.
Formerly: CMSC818X.

CMSC630 Foundations of Software Verification (3 Credits)
Topics in program verification. Operational semantics of programs. Preconditions and postconditions. Axiomatic proof systems and predicate transformers. Temporal logic and model checking. Process algebra, semantic equivalences and algebraic reasoning.
Prerequisite: CMSC330; or students who have taken courses with comparable content may contact the department; or permission of instructor.

CMSC631 Program Analysis and Understanding (3 Credits)
Techniques for static analysis of source code and modern programming paradigms. Analysis techniques: data flow analysis, program dependence graphs, program slicing, abstract interpretation. The meaning of programs: denotational semantics, partial evaluation. Advanced treatment of abstraction mechanisms: polymorphic types, operation overloading, inheritance, object-oriented programming and ML-like programming languages.
Prerequisite: CMSC330; or students who have taken courses with comparable content may contact the department; or permission of instructor.

CMSC634 Empirical Research Methods for Computer Science (3 Credits)
A graduate-level introductory course on empirical reseach methods for computer scientists. Experimental techniques for evaluating software systems and processes, human performance using interfaces, programming environments, and software engineering methods. Introduction to constructs and methods of measurements, qualitative and quantitative design, quasi-experimental and non-experimental design, baseline design, and statistical analysis.
Recommended: An introductory statistics class.
Restriction: Must be in Computer Science (Master's) program; or must be in Computer Science (Doctoral) program; or permission of instructor.
Credit Only Granted for: CMSC838G (Fall2005) or CMSC634.

CMSC651 Analysis of Algorithms (3 Credits)
Efficiency of algorithms, orders of magnitude, recurrence relations, lower-bound techniques, time and space resources, NP-complete problems, polynomial hierarchies, and approximation algorithms. Sorting, searching, set manipulation, graph theory, matrix multiplication, fast Fourier transform, pattern matching, and integer and polynomial arithmetic.
Prerequisite: CMSC451.

CMSC656 Introduction to Cryptography (3 Credits)
Introduction to modern cryptography. Topics include symmetric-key encryption, hash functions, message-authentication codes, block-cipher design, theoretical foundations, number theory, public-key encryption, and digital signatures.
Prerequisite: CMSC451, CMSC452, or CMSC456.
Credit Only Granted for: CMSC656 or CMSC858K.
Formerly: CMSC858K.

CMSC657 Introduction to Quantum Information Processing (3 Credits)
An introduction to the field of quantum information processing. Students will be prepared to pursue further study in quantum computing, quantum information theory, and related areas.
Prerequisite: Familiarity with complex numbers and basic concepts in linear algebra (e.g., eigenvalues, eigenvectors, Hermitian and unitary matrices) is required.
Credit Only Granted for: CMSC657 or CMSC858K.
Formerly: CMSC858K.
Additional Information: Previous background in quantum mechanics or theory of computation is not required.

CMSC660 Scientific Computing I (3 Credits)
Fundamental techniques in scientific computation with an introduction to theory and software for each topic. Computer numbers and sources of errors, numerical linear algebra, optimization, and Monte Carlo methods.
Prerequisite: Must have knowledge of Matlab or Python.
Cross-listed with: AMSC660.
Credit Only Granted for: AMSC660 or CMSC660.

CMSC661 Scientific Computing II (3 Credits)
Numerical methods for solving ordinary and partial differential equations (elliptic, parabolic, hyperbolic, and dispersive): motivation, analysis, and implementation. Finite difference methods, finite element methods, Fourier and Chebyshev spectral methods, and meshless methods.
Prerequisite: Must have knowledge of Matlab or Python. Must have basic knowledge of ordinary and partial differential equations (MATH246 and MATH462 or equivalent, or permission of instructor).
Cross-listed with: AMSC661.
Credit Only Granted for: AMSC661 or CMSC661.

CMSC662 Computer Organization and Programming for Scientific Computing (3 Credits)
This course presents fundamental issues of computer hardware, software parallel computing, and scientific data management for programming for scientific computation.
Prerequisite: Must have Knowledge of C or Fortran.
Cross-listed with: AMSC662.
Credit Only Granted for: AMSC662 or CMSC662.

CMSC663 Advanced Scientific Computing I (3 Credits)
In the sequence Advanced Scientific Computing I & Advanced Scientific Computing II, (CMSC663/CMSC663 and AMSC664/CMSC664, respectively) students work on a year-long individual project to develop software for a scientific task in a high performance computing environment. Lectures will be given on available computational environments, code development, implementation of parallel algorithms.
Prerequisite: AMSC660 or CMSC660; and (AMSC661 or CMSC661).
Cross-listed with: AMSC663.
Restriction: Permission of instructor.
Credit Only Granted for: AMSC663 or CMSC663.

CMSC664 Advanced Scientific Computing II (3 Credits)
In the sequence Advanced Scientific Computing I & Advanced Scientific Computing II, (AMSC663/CMSC663 and CMSC664/CMSC664, respectively) students work on a year-long individual project to develop software for a scientific task in a high performance computing environment. Lectures will be given on available computational environments, code development, implementation of parallel algorithms.
Prerequisite: AMSC663 or CMSC663.
Cross-listed with: AMSC664.
Restriction: Permission of instructor.
Credit Only Granted for: AMSC664 or CMSC664.

CMSC666 Numerical Analysis I (3 Credits)
Approximation theory, numerical solution of initial-value problems, iterative methods for linear systems, optimization.
Prerequisite: CMSC466 or AMSC466; and MATH410.
Cross-listed with: AMSC666.
Credit Only Granted for: AMSC666 or CMSC666.

CMSC673 Capstone in Machine Learning (3 Credits)
Semester-long project course in which each student will identify and carry out a project related to machine learning, with the goal of publishing a research paper or software tool.
Prerequisite: Minimum grade of C-in CMSC421 or CMSC422.
Jointly offered with: CMSC473.
Credit Only Granted for: CMSC673, CMSC798P, CMSC473, or CMSC498P.
Formerly: CMSC798P.

CMSC701 Computational Genomics (3 Credits)
An introduction to the algorithms and heuristics used in the analysis of biological sequences. Includes an introduction to string matching and alignment algorithms, phylogenetic analysis, string reconstruction (genome assembly), and sequence pattern recognition (gene and motif finding). A particular emphasis will be placed on the design of efficient algorithms and on techniques for analyzing the time and space complexity of these algorithms. Computational concepts will be presented in the context of current biological applications. No prior knowledge of biology necessary.

CMSC702 Algorithmic Evolutionary Biology (3 Credits)
Covers fundamental computational problems from comparative genomics and evolutionary biology. Topics include multiple sequence alignment and the reconstruction of evolutionary histories (e.g., phylogenetic trees and networks). These tasks are typically framed as NP-hard optimization problems, motivating the development of heuristics based on constraints, graph algorithms, and more recently machine learning. We analyze algorithms from the empirical and theoretical perspectives (e.g., computational complexity, optimality guarantees, and statistical consistency under popular models of evolution). Lastly, we discuss how algorithms are leveraged in emerging applications, like evolutionary analyses of tumors and pathogens, along with their limitations and directions for future research.
Restriction: Restricted to Master's/Doctoral students in Computer Science, Electrical and Computer, Engineering, Mathematics, Bioengineering, or permission of instructor.
Credit Only Granted for: CMSC702 or CMSC829A.
Formerly: CMSC829A.

CMSC711 Computer Networks (3 Credits)
Priciples, design, and performance evaluation of computer networks. Network architectures including the ISO model and local area networks (LANs). Communication protocols and network topology.
Prerequisite: CMSC412; or students who have taken courses with comparable content may contact the department.

CMSC714 High Performance Computing Systems (3 Credits)
Slected topics in high-performance systems, including contemporary architectures, interconnection topologies, shared memory and message-passing systems, multi-threaded kernels, latency avoidance and hiding techniques, methods for data and workload partitioning performance profiling, debugging.
Prerequisite: CMSC411 and CMSC412; or permission of instructor.

CMSC715 Wireless and Mobile Systems for the IoT (3 Credits)
Research on the Internet of Things (IoT), from the perspective of wireless networking and mobile sensing. Various techniques, algorithms, and systems that leverage the sensors in smartphones, smartwatches, drones, and IoT devices, to deliver real-world applications
Prerequisite: CMSC417; or permission of instructor.
Recommended: STAT100, MATH141, MATH240, and CMSC106; or equivalent courses .
Credit Only Granted for: CMSC818W or CMSC715.
Formerly: CMSC818W.

CMSC722 Artificial Intelligence Planning (3 Credits)
Automated planning of actions to accomplish some desired goals. Basic algorithms, important systems, and new directions in the field of artificial intelligence planning systems.
Prerequisite: CMSC421; or students who have taken courses with comparable content may contact the department; or permission of CMNS-Computer Science department.

CMSC723 Natural Language Processing (3 Credits)
Introduce fundamental concepts, techniques, and algorithms for the computational handling of natural language. Statistical and machine learning techniques, models, and algorithms that enable computers to deal with the ambiguity and implicit structure of human language. Approaches that focus on uncovering linguistic structure, such as syntactic or semantic parsing, as well as those that focus on manipulating text in useful ways, such as question answering or machine translation.
Prerequisite: Minimum grade of C- in CMSC422; and permission of CMNS-Computer Science department.
Cross-listed with: INST735, LING723.
Credit Only Granted for: CMSC723, LING723, or INST735.
Additional Information: CMSC students may only receive PhD Comp. credit for CMSC723 or CMSC823, not both.

CMSC724 Database Management Systems (3 Credits)
Theoretical and implementation issues in advanced database systems. Topics include distributed databases, parallel databases, database client-server architectures, multimedia access methods, advanced query optimization techniques, data semantics and models, object-oriented databases, and deductive and expert database systems.
Restriction: Must be in one of the following programs (Computer Science (Master's); Computer Science (Doctoral)) ; or permission of instructor; or permission of CMNS-Computer Science department.

CMSC725 Geographical Information Systems and Spatial Databases (3 Credits)
Topics in geographic information systems and spatial databases. Integrates related results from databases, cartography, geography, computer graphics, file access methods, computational geometry, image processing, data structures, and programming languages. Topics include: cartographic modeling, principles of cartography, methods from computational geometry, principles of spatial databases, access methods, and spatial data structures. The architecture of some existing spatial databases and geographic information systems will be examined in greater detail.
Prerequisite: CMSC424 and CMSC420; or permission of instructor.

CMSC726 Machine Learning (3 Credits)
An introduction to modern statistical data analysis using machine learning techniques. The course quickly surveys elementary statistical models (decision trees, nearest neighbors and linear regression) and moves on to more complex algorithms such as support vector machines, boosting, neural networks, structured prediction, apprenticeship learning, online learning, bandits, recommender systems and reinforcement learning. Throughout an emphasis is placed on mathematical rigor.
Prerequisite: CMSC421 or CMSC422; or students who have taken courses with comparable content may contact the department; or permission of instructor.

CMSC727 Neural Modeling (3 Credits)
Fundamental methods of neural modeling. Surveys historical development and recent research results from both the computational and dynamical systems perspective. Logical neurons, perceptrons, linear adaptive networks, attractor neural networks, competitive activation methods, error back-propagation, self-organizing maps, and related topics. Applications in artificial intelligence, cognitive science, and neuroscience.
Prerequisite: CMSC421; or students who have taken courses with comparable content may contact the department; or permission of instructor.

CMSC730 Interactive Technologies in Human-Computer Interaction (3 Credits)
Ubiquitous and mobile computing, wearables, virtual/augmented reality, natural user interfaces, tangible UIs, interactive fabrication.
Restriction: Must be in the Computer Science Master's or Doctoral program; or permission of instructor.
Credit Only Granted for: CMSC838J or CMSC730.
Formerly: CMSC838J.

CMSC732 Human Factors in Security and Privacy (3 Credits)
Introducing a variety of important topics at the intersection of human factors and privacy and security, and developing skills in designing human-subjects studies to evaluate problems and solutions related to these topics.
Recommended: Previous coursework in human-computer interaction, security and privacy.
Credit Only Granted for: CMSC818D or CMSC732.
Formerly: CMSC818D.

CMSC733 Computer Processing of Pictorial Information (3 Credits)
Input, output, and storage of pictorial information. Pictures as information sources, efficient encoding, sampling, quantization, approximation. Position-invariant operations on pictures, digital and optical implementations, the pax language, applications to matched and spatial frequency filtering. Picture quality, image enhancement and image restoration. Picture properties and pictorial pattern recognition. Processing of complex pictures; figure extraction, properties of figures. Data structures for pictures description and manipulation; picture languages. Graphics systems for alphanumeric and other symbols, line drawings of two- and three-dimensional objects, cartoons and movies.
Prerequisite: CMSC420.

CMSC734 Information Visualization (3 Credits)
Information visualization defined in relation to graphics, scientific visualization, databases, data mining, and human-computer interaction. Visualizations for dimensional, temporal, hierarchical and network data. Examines design alternatives, algorithms and data structures, coordinated views, and human factors evaluations of efficacy.
Prerequisite: CMSC434; or students who have taken courses with comparable content may contact the department; or permission of instructor.

CMSC740 Advanced Computer Graphics (3 Credits)
An introduction to advanced concepts in computer graphics. Includes an introduction to realistic rendering based on physical properties of light transport, radiometric concepts, and the rendering equation; Monte Carlo integration techniques to solve the rendering equation such as path tracing and multiple importance sampling; and neural network techniques for efficient sampling and denoising. Further discusses recent advances in 3D modeling and reconstruction, such as neural network-based 3D reconstruction; inverse rendering using neural radiance fields and differentiable rendering; and generative modeling for images, videos, and 3D data.
Prerequisite: MATH240 and CMSC420; or permission of instructor.

CMSC742 Algorithms in Machine Learning: Guarantees and Analyses (3 Credits)
Machine learning studies automatic methods for learning to make accurate predictions, to understand patterns in observed features and to make useful decisions based on past observations. This course introduces theoretical machine learning, including mathematical models of machine learning, and the design and rigorous analysis of learning algorithms. Topics include: (1) Learning theory (traditional and modern), including PAC learning basics, Boosting theory and PAC learning in neural nets. (2) Latent variable graphical models, including spectral methods for learning latent variable models. (3) Reinforcement learning theory, including algorithms, sample complexity and analyses.
Prerequisite: CMSC422 or equivalent; or permission of instructor.
Credit Only Granted for: CMSC828U or CMSC732.
Formerly: CMSC828U.

CMSC751 Parallel Algorithms (3 Credits)
A presentation of the theory of parallel computers and parallel processing. Models of parallel processing and the relationships between these models. Techniques for the design and analysis of efficient parallel algorithms including parallel prefix, searching, sorting, graph problems, and algebraic problems. Theoretical limits of parallelism.
Prerequisite: CMSC451; or ENEE641; or students who have taken courses with comparable content may contact the department.
Cross-listed with: ENEE651.
Credit Only Granted for: ENEE459P, ENEE651, ENEE759K or CMSC751.
Formerly: ENEE759K.

CMSC752 Ramsey Theory and its Applications (3 Credits)
Theorems about when a coloring of a graph (or other objects) has to yield a nice monochromatic object. Applications will be to computer science theory and to mathematics.
Prerequisite: Any CMSC45X course or any 400-level math course.
Credit Only Granted for: CMSC858R or CMSC752.
Formerly: CMSC858R.

CMSC754 Computational Geometry (3 Credits)
Introduction to algorithms and data structures for computational problems in discrete geometry (for points, lines, and polygons) primarily in two and three dimensions. Topics include triangulations and planar subdivisions, geometric search and intersection, convex hulls, Voronoi diagrams, Delaunay triangulations, line arrangements, visibility, and motion planning.
Prerequisite: CMSC451 and CMSC420; or permission of instructor.

CMSC756 Robotics (3 Credits)
Overview on fundamental components of robotic systems, including the sensing and actuation, control and modeling of motion and perception, dynamics and kinematics, motion planning and manipulation of robots.
Prerequisite: CMSC420, CMSC106, CMSC466, and MATH240; or equivalent.
Restriction: Must be in the Computer Science Master's or Doctoral programs.
Credit Only Granted for: CMSC818N or CMSC756.
Formerly: CMSC818N.

CMSC763 Advanced Linear Numerical Analysis (3 Credits)
Advanced topics in numerical linear algebra, such as dense eigenvalue problems, sparse elimination, iterative methods, and other topics.
Prerequisite: AMSC666 or CMSC666; or permission of instructor.
Cross-listed with: AMSC763.
Credit Only Granted for: AMSC600, AMSC763, CMSC760, or CMSC763.
Formerly: AMSC600 and CMSC760.

CMSC764 Advanced Numerical Optimization (3 Credits)
Modern numerical methods for solving unconstrained and constrained nonlinear optimization problems in finite dimensions. Design of computational algorithms and the analysis of their properties.
Prerequisite: MATH410 or equivalent; or permission of instructor.
Credit Only Granted for: AMSC607, AMSC764, or CMSC764.

CMSC773 Computational Linguistics II (3 Credits)
Natural language processing with a focus on corpus-based statistical techniques. Topics inlcude: stochastic language modeling, smoothing, noisy channel models, probabilistic grammars and parsing; lexical acquisition, similarity-based methods, word sense disambiguation, statistical methods in NLP applications; system evaluation.
Prerequisite: CMSC723, INST735, or LING723; or permission of instructor. Cross-listed with LING773, INST736.
Credit Only Granted for: CMSC773, LING773, or INST736.
Additional Information: CMSC students may only receive PhD Comp. credit for CMSC723 or CMSC823, not both.

CMSC798 Master's Non-Thesis Research (1-6 Credits)
Master's Non-Thesis Research
Restriction: Permission of CMNS-Computer Science department.
Repeatable to: 6 credits.

CMSC799 Master's Thesis Research (1-6 Credits)

CMSC800 How to Conduct Great Research (1 Credit)
Develop research skills so as to promote high quality and high impact.
Restriction: Must be in the Computer Science doctoral program.
Credit Only Granted for: CMSC798F or CMSC800.
Formerly: CMSC798F.

CMSC801 Department Internal Research Seminar (1 Credit)
Research overviews from faculty to help introduce departmental research to graduate students.
Credit Only Granted for: CMSC798E or CMSC801.
Formerly: CMSC798E.

CMSC818 Advanced Topics in Computer Systems (1-3 Credits)
Advanced topics selected by the faculty from the literature of computer systems to suit the interest and background of students.
Restriction: Permission of instructor.
Repeatable to: 99 credits.

CMSC828 Advanced Topics in Information Processing (1-3 Credits)
Advanced topics selected by the faculty from the literature of information processing to suit the interest and background of students.
Restriction: Permission of instructor.
Repeatable to: 99 credits.

CMSC829 Advanced Topics in Bioinformatics and Computational Biology (3 Credits)
Advanced topics selected by the faculty from the literature of bioinformatics to suit the interest and background of students.

CMSC838 Advanced Topics in Programming Languages (1-3 Credits)
Advanced topics selected by faculty from the literature of programming languages to suit the interest and background of students.
Restriction: Permission of instructor.
Repeatable to: 99 credits.

CMSC839 Advanced Topics in Human-Computer Interaction (1-3 Credits)
Advanced topics selected by the faculty from the literature of human-computer interaction to suit the interest and background of students.
Repeatable to: 15 credits.

CMSC848 Selected Topics in Information Processing (1-3 Credits)
Selected topics by the faculty from the literature of information processing to suit the interest and background of students.
Repeatable to: 99 credits if content differs.

CMSC858 Advanced Topics in Theory of Computing (1-3 Credits)
Advanced topics selected by the faculty from the literature of theory of computing to suit the interest and background of students.
Restriction: Permission of instructor.
Repeatable to: 99 credits.

CMSC878 Advanced Topics in Numerical Methods (1-3 Credits)
Advanced topics selected by the faculty from the literature of numerical methods to suit the interest and background of students.
Restriction: Permission of instructor.
Repeatable to: 99 credits.

CMSC898 Pre-Candidacy Research (1-8 Credits)
Advanced topics selected by the faculty from the literature of applications of computer science to suit the interest and background of students.
Restriction: Permission of instructor.

CMSC899 Doctoral Dissertation Research (1-8 Credits)

COMM - Communication

COMM400 Research Methods in Communication (3 Credits)
Philosophy of scientific method; role of theory; research ethics; empirical research methods (measurement, sampling, design, analysis).
Prerequisite: COMM250; and must have an introductory course in statistics.
Restriction: Must be in Communication program.
Credit Only Granted for: COMM400 or COMM307.

COMM401 Interpreting Strategic Discourse (3 Credits)
Principles and approaches for practical analysis of discourse designed to shape audience opinion.
Prerequisite: COMM250.
Restriction: Must be in Communication program.

COMM402 Communication Theory and Process (3 Credits)
Philosophical and conceptual analysis of communication theories.
Prerequisite: COMM250.
Restriction: Must be in Communication program.

COMM406 English Writing in Professional Communication Contexts (3 Credits)
Enhance skills in writing for a diversity of professional communication contexts, including business, health, law, and education.

COMM407 Advanced Public Speaking (3 Credits)
Enhance skills in public speaking for a diversity of professional communication contexts, including business, health, law, and education.
Prerequisite: COMM107 or COMM200; or any course that counts for the General Education Fundamental Studies Oral Communication requirement.

COMM419 Special Topics in Health Communication (3 Credits)
Covers a variety of topics of health communication. Blends theoretical concepts and practical concerns that impact upon health communication processes. This course covers a specific topic of health communication in greater depth and applies scholarly discoveries to real-world examples.
Prerequisite: COMM304.
Restriction: Must be in the Communication Major.
Repeatable to: 12 credits if content differs.

COMM420 Theories of Group Discussion (3 Credits)
Current theory, research and techniques regarding small group process, group dynamics, leadership and decision-making.

COMM421 Communicating Leadership (3 Credits)
Examines the nature of leadership, theories of leadership from a communication perspective, relationships between leadership, authority, power, and ethics. Explores leadership responsibilities, commitments, and actions.

COMM422 Communication Management (3 Credits)
Communication policies, plans, channels, and practices in the management of the communication function in organizations.

COMM423 Communication Processes in Conferences (3 Credits)
Group participation in conferences, methods of problem solving, semantic aspects of language, and the function of conferences in business, industry and government settings.

COMM424 Communication in Complex Organizations (3 Credits)
Structure and function of communication within organizations: organizational climate and culture, information flow, networks and role relationships.

COMM425 Negotiation and Conflict Management (3 Credits)
Role of communication in shaping negotiation and conflict processes and outcomes.

COMM426 Conflict Management (3 Credits)
Role of communication in managing conflict processes.
Recommended: COMM425 and COMM250.

COMM427 Crisis Communication (3 Credits)
Explores theories and research related to communication before, during, and after a crisis. Students examine the fundamentals of organizational communication, crisis management, and strategic and crisis communication planning before examining case studies of a number of real-life crises: organizational crises, natural disasters, accidents, terrorism incidents, health crises, and major crises of credibility.

COMM428 Special Topics Seminar in Dialogues and Deliberation (3 Credits)
A study in public dialogue and deliberation theory and practice. This course will integrate recorded lectures, readings, videos, Public Dialogues, teamwork, and historical research.
Prerequisite: COMM250; and must have completed or be concurrently enrolled in COMM306.
Restriction: Must be in the Communication Major.
Repeatable to: 12 credits if content differs.

COMM434 Legal Communication (3 Credits)
Designed for professionals working in legal communication fields. The course is centered on knowledge of the legal process, legal terminology, theoretical and practical knowledge of legal communication, and knowledge of the U.S. legal system at the city, county, state, and federal levels.

COMM435 Theories of Interpersonal Communication (3 Credits)
Major theoretical approaches and research trends in the study of interpersonal communication.

COMM436 Interpersonal Arguing (3 Credits)
An examination of face to face arguing.
Prerequisite: COMM400 and COMM250.
Restriction: Must be in Communication program.
Credit Only Granted for: COMM436 or COMM498I.
Formerly: COMM498I.

COMM445 Principles and Practices to Facilitate Democratic Dialogue (3 Credits)
Exposes students to models of communication informed by democratic principles and research on facilitating dialogue and deliberation. Students research community groups, facilitate relational communication, and work through community issues.
Prerequisite: COMM345.
Credit Only Granted for: COMM445 or COMM428D.
Formerly: COMM428D.

COMM448 Special Topics in Public Relations (3 Credits)
Courses seek to examine historical and current communication management theories, literature and practices for the purposes of understanding the business environment in which public relations/communication management operates and applying the best of these theories and practices toward the management of the public relations/communications functions of an organization.
Prerequisite: COMM201.
Restriction: Must be in the Communication Major.
Repeatable to: 12 credits if content differs.

COMM449 Special Topics in Digital Communication (3 Credits)
Explores the topics that have arisen around computers, digital technologies, the internet, big data, surveillance capitalism, and network infrastructures.
Repeatable to: 12 credits if content differs.

COMM450 Ancient Worlds of Rhetoric (3 Credits)
A survey of rhetorical theory across different cultures in antiquity. Emphasizes cultural contexts in which rhetorical acts of advising, instructing, persuading, and arguing emerge. Draws connections between ancient theories and contemporary communication problems.
Prerequisite: COMM250.
Restriction: Must be in Communication program.
Credit Only Granted for: COMM450 or COMM650.

COMM452 Rhetoric, Technology, and Culture (3 Credits)
An investigation of the intersections between rhetoric, technology, and culture. Emphasizes critical and cultural approaches to communication technologies. Draws lessons from the history of rhetoric and media to inform contemporary understandings of communication in the context of digitality.

COMM454 Rhetoric of the 1960s (3 Credits)
Study of key rhetoric of the 1960s. Treats rhetoric of relevant Presidents and several protest movements including civil rights, anti-war, and women's liberation. Contrasts traditional modes of argument with alternative rhetorical forms.
Prerequisite: COMM301.

COMM456 Freedom of Speech & the First Amendment (3 Credits)
Examines the U.S. Supreme Court's rulings on freedom of speech cases as grounded in the First Amendment to the U.S. Constitution. It also considers the political and ideological role of "freedom of speech" as a rhetoric organizing and ordering U.S. political culture.
Credit Only Granted for: COMM498Y or COMM456.
Formerly: COMM498Y.

COMM458 Seminar in Political Communication (3 Credits)
The examination of special topics for and theories of political communication.
Prerequisite: COMM250.
Repeatable to: 12 credits if content differs.

COMM459 Special Topics in Science Communication (3 Credits)
This seminar course is designed to help students learn a variety of topics of science communication.
Repeatable to: 12 credits if content differs.

COMM460 Public Life in American Communities, 1634-1900 (3 Credits)
Ways that Americans have used their voice to create public life. Focus is on the diverse social communities that have characterized American life and the place and characteristics of oral discourse in each.

COMM461 Voices of Public Leadership in the Twentieth Century (3 Credits)
Study of the use of speaking in the power struggles of the twentieth century. Focus is on important speakers of the century, their social and policy influence, and the struggle to expand the diversity of voices with power in the public sphere.

COMM462 Visual Communication (3 Credits)
The study of visual communication should change the way one sees the world. Students will observe, analyze, and critique visual images. The ascendance of images in our contemporary world will be demonstrated, methods for critically comprehending how images do persuasive work will be identified, and students will develop a vocabulary for critiquing images, and assist students in creating compelling images.
Credit Only Granted for: COMM462 or COMM498V.
Formerly: COMM498V.

COMM468 Seminar in Mediated Communication (3 Credits)
The examination of special topics related to the study of mediated communication.
Restriction: Junior standing or higher.
Repeatable to: 12 credits if content differs.

COMM469 The Discourse of Social Movements (3 Credits)
Study of key social movements that have influenced American social and political life.
Recommended: COMM301.
Restriction: Junior standing or higher.
Repeatable to: 12 credits if content differs.

COMM470 Listening (3 Credits)
The principles of listening behavior.

COMM472 Nonverbal Communication (3 Credits)
Nonverbal communication in human interaction theory and research on proxemics, kinesics and paralanguage as expression of relationship, affect and orientation within and across cultures.

COMM475 Persuasion (3 Credits)
Bases of persuasion, with emphasis on recent experimental developments in persuasion.

COMM476 Language, Communication, and Action (3 Credits)
Communication as symbolic action through the study of communication ethics. Emerging ethical principles and decision-making in public discourse, interpersonal communication, organizational communication, public relations, health communication, and crisis communication.
Restriction: Must be in the Communication major.

COMM477 Discourse Analysis (3 Credits)
Concepts of textual and discourse analysis applied to speech situations.

COMM478 Communication Colloquium (1 Credit)
Current trends and issues in the field of communication, stressing recent research methods. Recommended for senior and graduate student majors and minors in communication.
Repeatable to: 4 credits if content differs.

COMM482 Intercultural Communication (3 Credits)
The major variables of communication in an intercultural context: cultural, racial and national differences; stereotypes; values; cultural assumptions; and verbal and nonverbal channels.

COMM483 Senior Seminar in Public Relations (3 Credits)
Integration of theory, techniques and research methods into the planning and execution of public relations campaigns for specific organizations. Analysis of research on the case studies of public relations.
Prerequisite: COMM351; and 1 course from (COMM305, COMM306, COMM307, or COMM400).
Additional Information: Students who enrolled after Fall 2020 should not take COMM400 as a prerequisite.

COMM488 Communication Portfolio Project (1 Credit)
Preparation of the professional communication portfolio.
Restriction: Senior standing; and must be in Communication program.
Repeatable to: 3 credits if content differs.

COMM489 Topical Research (1-3 Credits)
Individualized research projects conducted with a faculty sponsor.
Prerequisite: Permission of ARHU-Communication department.
Repeatable to: 6 credits if content differs.

COMM498 Seminar (3 Credits)
Present-day communication research.
Restriction: Permission of instructor; and senior standing.
Repeatable to: 12 credits.

COMM601 Historical-Critical Research in Communication (3 Credits)
Intense study in critical and historical methodology as applicable to research in communication. Emphasis will be placed on the composition and the evaluation of historical-critical studies of significance in the field of rhetorical communication scholarship.
Formerly: SPCH601.

COMM602 Communication Theory (3 Credits)
Fundamental concepts, approaches, and problems in communication theory.
Restriction: Must be in one of the following programs (Communication (Master's); Communication (Doctoral)).

COMM604 Argumentation Theory (3 Credits)
Fundamental concepts, approaches, and problems in argumentation theory.

COMM606 Seminar in Communication Management (3 Credits)
Communication and public relations as a managed function of organizations are introduced. Students learn how managing communication contributes to organizational effectiveness. Using organizational theory, theories of Excellence in public relations and communication management, communication metrics and communication ethics, students build their communication strategic management skills beyond the programmatic level to the functional and organizational levels of decision-making.
Restriction: Restricted to GCPS (Z045) in Communication; or must be in Public Management-Executive Masters (Master's) program.

COMM607 Seminar in Communication Management Publics (3 Credits)
Research and analysis of publics and how the use of this information builds more effective relationships with strategic constituencies of organizations are emphasized. Students learn and apply to communication management problems the theories of audience segmentation, stakeholders, behavior of activist organizations, conflict resolution, environmental scanning, ethics of organization-public relationships and the situational theory of publics.
Restriction: Restricted to GCPS (Z045) in Communication; or must be in Public Management-Executive Masters (Master's) program.

COMM609 Fundamentals of Interpreting (1-6 Credits)
Develops a systematic, reflective approach to interpreting tasks in real-world settings and outlines the use of different modes of interpreting under professional working conditions. Provides an overview of interpreting skills with exercises to develop them, including focus on active listening and analysis, effective use of memory, and delivery of the target message. Interpreting strategies and techniques in both dialogue and formal consecutive settings are discussed and practiced in a range of interpreting domains. Includes sight translation.
Prerequisite: Students must complete an admissions test for first year courses; and permission of ARHU-Communication department.
Repeatable to: 8 credits.

COMM610 Introduction to Translation and Interpreting Studies (3 Credits)
Provides an overview of the interdisciplinary fields of Translation and Interpreting Studies and establishes relationships between scholarly study and professional practice. Examines how theories and concepts inform practice, guide to a higher level of competence, and address issues of interlingual, intercultural mediation in authentic, real-world settings both past and present. serves as a foundation course for reflective practice and portfolio work through action research methodology and process
Prerequisite: Students must complete an admissions test for first year courses; and permission of ARHU-Communication department.

COMM611 Seminar in Global Communication Management (3 Credits)
Global Communication Management extends the theories of communication management developed in COMM606 and COMM607 to a global level. Students move beyond Western communication management assumptions to examine how practices of communication management differ in different national and/or cultural contexts. Students are challenged to build generic principles of communication management with specific applications that can be used and adapted in the differing countries and cultures of the world whether working in multinational corporations, national governments, or non-governmental organizations (NGO's).
Restriction: Restricted to GCPS (Z045) in Communication; or must be in Public Management-Executive Masters (Master's) program.

COMM618 Professional Communication: Rhetoric & Style (3 Credits)
Writing instruction in English for professional communicators with a focus on rhetoric, style, and grammar. Designed to teach English writing skills focused on message creation and organization, sentence structure, and language use, typologies of rhetorical genres, registers, and style, research skills, summary-writing skills, to editing skills, and vocabulary building in English writing.
Repeatable to: 6 credits.

COMM619 Consecutive Interpretation (1-6 Credits)
Builds upon the systematic, reflective approach to interpreting in real-world settings introduced in Fundamentals of Interpreting. Consecutive interpreting skills are consolidated through individual and group practice, and any remaining challenges related to consecutive interpreting sub-skills are identified and addressed. Stresses effective analysis, note-taking, and use of voice during exercises in sight translation, dialogue, and formal consecutive interpreting.
Prerequisite: COMM609; and must have completed an admissions test for first year courses; and permission of ARHU-Communication department.
Repeatable to: 8 credits.

COMM628 Organization Communication: Research and Intervention (3 Credits)
The role of the internal and external communication consultant as an organizational change-agent. Emphasis upon data gathered to facilitate the communication development of the organization.
Prerequisite: COMM424; or permission of instructor.
Repeatable to: 6 credits if content differs.
Formerly: SPCH628.

COMM629 Introduction to Simultaneous Interpretation (1 Credit)
Builds upon the overview of the simultaneous mode in Fundamentals of Interpreting by reviewing the relationship between consecutive and simultaneous skills and introducing work in the booth. Challenges of simultaneous interpreting, including split attention, ear-voice span, and voice and microphone technique are addressed. Participants become familiar with the booth and exercises required to build simultaneous skills. Role and use of portable equipment in professional settings are discussed. Recommended as preparation for the M.A. entrance examination.
Prerequisite: Admissions test for Graduate Certificate in Interpreting; and COMM609; and permission of ARHU-Communication department.
Recommended: COMM619.
Repeatable to: 3 credits if content differs.

COMM630 Seminar in Public Relations Management (3 Credits)
Relationship of public relations management to organizational structure and communication functions. Objectives, planning, staffing, budgeting, administering, and evaluation of public relations programs.
Credit Only Granted for: COMM630 or JOUR630.
Formerly: JOUR630.

COMM631 Seminar in Public Relations Publics (3 Credits)
Analysis of public relations programs aimed at organizational publics. Media, issue-related, community, employee, governmental, consumer, financial, and student/educator publics. Theories of the nature of publics, communication behavior of publics, and effects of public relations programs aimed at different publics.
Credit Only Granted for: COMM631 or JOUR631.
Formerly: JOUR631.

COMM633 Global Public Relations (3 Credits)
Application of principles of public relations to countries or regions with different cultures, political systems, economic systems, levels of development, media systems, and levels of activism.
Credit Only Granted for: COMM633 or JOUR633.
Formerly: JOUR633.

COMM637 Professional Practice Forum in Translation: Career Portfolio and Exams (1 Credit)
Serves as final preparation for entry into the profession through development of career portfolio to meet summative degree requirement and development of strategies for gaining work as a professional translator. Prepares participants for degree examinations and employer tests through the review of previous exam material and employer testing requirements. Serves as venue for degree examinations, career goal setting and planning for future employment. Participants present and defend career portfolio as summative requirement for MA in translation; MA in Trans. and Localization Project.
Prerequisite: Admissions test for second year courses; and (COMM659 and COMM679); and permission of ARHU-Communication department.

COMM638 Professional Communication: Rhetoric & Voice (3 Credits)
A skills-based course in speaking instruction in English for professional communicators with a focus on public speaking, voice, diction, and pronunciation. Focuses on developing public speaking, voice, diction, and pronunciation skills. Designed to teach message creation and organization, sentence structure, and language use, vocal qualities designed to enhance proper pronunciation, breathing, and articulation skills, register variation, listening skills, English vocabulary, audience adaptation skills with attention to cultural distinctions, presentational skills with visual aids, and interpretive skills.
Repeatable to: 6 credits.

COMM639 Fundamentals of Translation (1-6 Credits)
Develops a systematic, reflective approach to translation involving both the written and spoken word. Provides an overview of domains of translation, associated text categories and translation tasks. Develops strategies to identify, analyze and resolve translation challenges in specific, authentic,real-world contexts. Working with a series of current texts, explores general translation concepts and language-specific strategies. Includes sight translation exercises and introduction to translation resources and computer tools used in the translators workplace.
Prerequisite: Admissions test for first year courses; and permission of ARHU-Communication department.
Repeatable to: 8 credits if content differs.

COMM641 Introduction to Computer-Assisted Translation (1 Credit)
Introduces the use of computer-assisted translation tools to support large-scale translation projects and streamline translation processes. Focuses on industry software products that utilize translation memory and terminology management systems. Discusses the role of tools in the entire translation process from pre- to post-editing.
Prerequisite: Admissions test for first year courses; and COMM639; and permission of ARHU-Communication department.

COMM649 Translation for Specific Domains (1-6 Credits)
Builds upon the systematic, reflective approach introduced in Fundamentals of Translation by addressing the development of translation skills required for specialization in specific domains. In written and sight translation exercises include researching specialized subject material, developing and maintaining terminology, and consulting experts in the field. Includes authentic, real-world translation projects in translation teams. Overview of computer-assisted translation tools and continued work on sight translation enable higher levels of productivity under time constraints.
Prerequisite: Admissions test for first year courses; and COMM639; and permission of ARHU-Communication department.
Repeatable to: 8 credits if content differs.

COMM652 Contemporary Rhetorical Theory (3 Credits)
A study of twentieth century theories of rhetoric. Special attention will be devoted to Richard Weaver, Kenneth Burke, Lloyd Bitzer, Ernest Bormann, Walter Fisher, and the continental theorists of communication such as Chaim Perelman and Jurgen Habermas.
Formerly: SPCH652.

COMM655 Seminar in Speechwriting (3 Credits)
Theoretical and practical aspects of speechwriting at an advanced level.
Formerly: SPCH655.

COMM657 Professional Practice Forum in Interpreting: Career Portfolio and Exams (1 Credit)
Serves as final preparation for entry into the profession through development of strategies for gaining work as a professional translator. Prepares participants for degree examinations and employer tests through the review of previous exam material and employer testing requirements. Serves as venue for degree examinations, career goal setting and planning for future employment. Participants present and defend career portfolio and summative requirement for degree.
Prerequisite: COMM719, COMM769, and COMM729; and admissions test for second-year courses; and permission of ARHU-Communication department.

COMM659 Translation for Language-Specific Markets (1-3 Credits)
Builds translation skills to a highly professional level by developing autonomy in completing authentic, real-world translation projects based upon the reflective approach developed in the first-year curriculum. Develops one or more specializations. Completion of individual and group projects covering all aspects of professional translation from subject matter research, terminology work, and use of computer-assisted translation tools. Sight translation and timed exercises to increase production and meet deadlines.
Prerequisite: Admissions test for second year courses; and permission of ARHU-Communication department.
Repeatable to: 8 credits.

COMM661 Communication and Social Change (3 Credits)
Place of rhetoric as the union of the moral and historical in moments of social definition. Reviews theories of discourse in social change including political change, social movements, consciousness change, and more global change. Application to contemporary change.

COMM668 Risk Communication (3 Credits)
Principles and approaches to risk communication. Emphasis is placed on theoretical trends in risk communication and application to industry. Topics include how to be an effective source of risk communication, understanding audiences, handling the media and designing messages.
Prerequisite: Permission of ARHU-Communication department.
Repeatable to: 9 credits if content differs.

COMM669 Professional Practice Forum in Translation: Practicum (1-3 Credits)
Provides opportunities to complete real-world translation projects on campus and in the public service, legal, business, and political communities as translators, project managers and translators/reviewers working on group projects. Collaboration with participants in the interpreting practicum is also sought to prepare multilingual texts for practicum events and familiarize participants with conference translation. Complements Translation for Specific Markets, and practicum projects are included in course and career reflective practice portfolios. Requires independent study plan agreed with course instructor.
Prerequisite: Admissions test for second year courses; and permission of ARHU-Communication department.
Repeatable to: 9 credits if content differs.

COMM679 Professional Practice Forum in Translation: Workplace Processes and Procedures (1 Credit)
Provides in-depth exploration of processes and procedures in public service, legal, and political settings requiring translation services. Prepares for translation in real-world settings by discussing procedures across sectors and institutions, enabling informed career plans and choices. Discusses ethics, professional conduct and business practices. Reinforces identity as a professional translator, develops specializations, and pursues professional and career development opportunities through interaction with members of the profession, professional organizations, and institutions in the language industry.
Prerequisite: Admissions test for second year courses; and permission of ARHU-Communication department.
Repeatable to: 3 credits if content differs.

COMM680 Communication Programs in Education and Training (3 Credits)
An analysis of instructional development in communication. Instructional objectives, strategies and evaluation are applied to educational, corporate and industrial training programs.
Formerly: SPCH680.

COMM681 Communication Issues in Human Resource Development (3 Credits)
Research in and theory of contemporary communication issues in the human resource development of governmental, corporate, business organizations.
Formerly: SPCH681.

COMM683 Intercultural Communication Theory (3 Credits)
An in-depth coverage of the essential theories of intercultural communication is provided.

COMM686 Teaching Communication (1 Credit)
Principles of effective teaching--content and process--in the college communication classroom.
Formerly: SPCH686.

COMM687 Professional Development in the Communication Discipline (1 Credit)
Knowledge and skills required for advancement as an academic professional in the communication discipline. Topics include types of academic institutions and posts, elements of academic performance, documentation of professional qualifications, how academic posts are secured, processes associated with tenure and promotion, processes of academic publication and history of the discipline.

COMM688 Communication Field Experience (1-6 Credits)
Applications of communication principles and research in professional communication settings.
Restriction: Permission of instructor.
Formerly: SPCH688.

COMM698 Special Problems in Communication (1-3 Credits)
Formerly: SPCH698.

COMM700 Introduction to Graduate Study in Communication (3 Credits)
Basic skills in communication research.
Restriction: Must be in Communication (Doctoral) program.
Formerly: SPCH700.

COMM701 Quantitative Methods in Communication Research (3 Credits)
Logic and methods of quantitative data collection and statistical analysis as applied to communication studies. Research strategies for communications: experimentation, survey research, field research, and content analysis.
Prerequisite: COMM700.
Formerly: SPCH701.

COMM708 Professional Communication: Rhetoric and Context (3 Credits)
A skills-based course in speaking and writing in English for professional communicators adapting to a diversity of contexts, including business, health, law, politics, and science. Focus on diversifying the different contexts in which speaking and writing take place. Designed to develop an ability to adapt messages to a diversity of professional communication contexts, address the role of culture in adapting messages to a diversity of professional communication contexts, hone English speaking and writing skills based on a diversity of language registers, gain experience working with technical vocabulary, enhance analytical skills, strengthen research skills, enhance critical thinking skills, develop software technology skills.
Repeatable to: 6 credits.

COMM710 Translation and Localization Project Management (3 Credits)
Introduces basic principles of project management in the translation industry based upon globalization and localization processes for software, websites, and other translation-driven products. Focuses on information technology and workflow in large-scale multilingual projects. Examines planning, execution, and evaluation processes grounded in best practices and standards of the translation and localization industry.
Prerequisite: Admissions test for second year courses; and permission of ARHU-Communication department.

COMM711 Historical/Critical Methods in Communication Research (3 Credits)
Methods for historical and critical research in communication. Formulation of significant research questions, systematic collection of bibliographic and phenomenal information, formulating substantial claims, organizing and writing research for disciplinary outlets.
Prerequisite: COMM700; or permission of instructor.
Formerly: SPCH711.

COMM712 Advanced Historical/Critical Methods in Communication Research (3 Credits)
Critical assessment of qualitative approaches to communication. Introduction to significant schools of historical and critical research. Advanced techniques for inquiry and manuscript preparation. Students must have dissertation research project requiring historical or critical method.
Restriction: Permission of instructor.

COMM713 Translation Technology (3 Credits)
Builds upon the principles outlined in Introduction to Computer-Assisted Translation to develop comprehensive knowledge of the current and future roles of technology in translation processes involving both the spoken and the written word, including use of widely available software tools and systems for terminology management, translation memory, and machine translation. Students carry out projects using translation technology, enabling them to apply newly acquired knowledge in applied contexts. Examination of case studies highlights how translation technology is leveraged across public and private sector organizations and the latest developments in the field.
Prerequisite: Admissions test for second year courses; and permission of ARHU-Communication department.

COMM714 Introduction to Qualitative Methods in Communication Research (3 Credits)
Methods for field research in communication including interiewing, ethnographic and participant intervention, focus groups, and content analysis. Formulation of significant research questions, systematic collection of field data, formulating substantial claims from the research, organizing and writing research from disciplinary outlets.
Restriction: Permission of instructor.

COMM715 Advanced Qualitative Methods in Communication Research (3 Credits)
Advanced data analysis of qualitative data in Communication research. In-field research and techniques for analysis of data from in-field work.

COMM718 Practicum in Research Proposal and Design (3 Credits)
Development of research proposal through research team interaction. In different semester the course focuses on different subdisciplines of communication.
Repeatable to: 6 credits.
Credit Only Granted for: COMM718 or JOUR632.
Formerly: JOUR632.

COMM719 Advanced Consecutive Interpretation (1-3 Credits)
Builds consecutive interpreting skills to a highly professional level by sharpening listening, processing, memory, note-taking, and delivery skills, enabling interpretation of highly complex material requiring particular attention to nuance, tone, and style. Includes dialogue and monologue interpreting exercises with specialized subject material. Participants emerge from the course as reflective practitioners with the simultaneous interpreting skills required to perform competently in real-world settings.
Prerequisite: Admissions test for second year courses; and permission of ARHU-Communication department.
Repeatable to: 8 credits if content differs.

COMM724 Seminar in Organizational Communication (3 Credits)
Theories and problems of human communication within, between, and/or among formal organizations will be emphasized.
Restriction: Permission of instructor.
Formerly: SPCH724.

COMM729 Simultaneous Interpretation (1-3 Credits)
Builds upon the discussion of the simultaneous mode and exercises in Introduction to Simultaneous Interpreting by reviewing the relationship between consecutive and simultaneous skills and introducing work in the booth in a series of progressive exercises. Addresses challenges such as coordination of split attention, ear-voice span, memory and delivery / presentation. Reinforces principles of collegial teamwork and good microphone technique in the booth. Enhances preparation skills required for interpretation of specialized subject matter.
Prerequisite: Admissions test for second year courses; and permission of ARHU-Communication department.
Repeatable to: 8 credits if content differs.

COMM730 Seminar in Health Communication (3 Credits)
Communication processes in health care and promotion.
Formerly: SPCH730.

COMM738 Seminar in Mediated Communication (3-12 Credits)
The examination of special topics related to the study of mediated communication.
Restriction: Permission of instructor.
Repeatable to: 12 credits if content differs.

COMM739 topics in Public Relations (3 Credits)
Seminar on specialized areas of scholarly research in public relations or on the practice of public relations in specialized organizational settings.
Repeatable to: 6 credits if content differs.
Formerly: JOUR739.

COMM748 The Rhetoric of the Presidency (3 Credits)
The study of the historical and contemporary rhetoric of the presidency in appropriate historical and political contexts. Scholarship related to public address studies and theories of the presidency will be featured.
Repeatable to: 9 credits if content differs.
Credit Only Granted for: COMM748 or COMM768.
Formerly: COMM768.

COMM749 Advanced Simultaneous Interpretation (1-3 Credits)
Builds simultaneous interpreting skills to a highly professional level, including highly complex material requiring particular attention to nuance, tone, and style. Resolves any remaining challenges of split attention, ear-voice span, memory and delivery / presentation. Introduces simultaneous interpretation with text, based upon sight translation techniques. Participants emerge from the course as reflective practitioners with the simultaneous interpreting skills required to perform competently in real-world settings.
Prerequisite: COMM729; and admissions test for second-year courses; and permission of ARHU-Communication department.
Repeatable to: 4 credits if content differs.

COMM758 Seminar in Rhetorical Theory (3 Credits)
Examination of selected theories of style drawn from the fields of rhetoric and literature, and analysis of model speeches.
Prerequisite: COMM460, COMM461, or COMM450.
Repeatable to: 12 credits if content differs.
Formerly: SPCH758.

COMM759 Professional Practice Forum in Interpreting: Practicum (1-3 Credits)
Provides opportunities to interpret consecutively and simultaneously in real-world settings on campus and in the public service, legal, business, and political communities. Develops team leader skills by organizing and convening an event or series of events (conference, debate, or negotiation), selecting topics and delegates, and preparing speeches and arguments to deliver and interpret. Collaboration with participants in M.A. translation courses is sought. Requires independent study plan agreed with course instructor.
Prerequisite: Admissions test for second-year courses; and permission of ARHU-Communication department.
Repeatable to: 9 credits if content differs.

COMM760 Seminar in Political Communication (3 Credits)
A blend of theory and practice to integrate rhetorical-critical theory and empirical methods with politics. Practitioners in political communication will be drawn in as resource persons. Students will map the communication strategy for candidates and analyze actual campaign strategies.
Formerly: SPCH760.

COMM762 The Rhetoric of Political Institutions (3 Credits)
The role of discourse in major political institutions is examined. The specific institutional focus may change from instructor to instructor. Examples include Congress, the courts, or the state legislatures.

COMM768 Seminar in Public Address (3 Credits)
An in-depth study of national and international speakers and issues throughout the history of the spoken word. Emphasis will be placed upon the application of rhetorical principles to the analysis of world speakers and their speeches.
Repeatable to: 12 credits if content differs.
Formerly: SPCH768.

COMM769 Professional Practice Forum in Interpreting: Workplace Processes and Procedures (1-2 Credits)
Provides in-depth exploration of processes and procedures in public service, legal, and political settings where interpreting services are commonplace. Enables students to make informed career plans and choices. Empowers participants by helping to establish and reinforce identity as a professional interpreter, develop specializations, and pursue professional and career development opportunities through interaction with members of the profession, professional organizations, and institutions in the language industry.
Prerequisite: Admissions test for second-year courses; and permission of ARHU-Communication department.
Repeatable to: 3 credits if content differs.

COMM775 Seminar in Persuasion and Attitude Change (3 Credits)
This seminar will concentrate on the problem of making message strategy decisions. Course content will consist of study of both theoretical and empirical research on attitude and attitude change in persuasive communication.
Prerequisite: Permission of ARHU-Communication department.
Formerly: SPCH775.

COMM778 Special Topics in Health and Risk Communication (3 Credits)
This graduate seminar introduces students to special topics in health and risk communication such as media and public health, health message design, risk perception and communication, health and environmental communication, health literacy, etc. It blends theoretical concepts with practical concerns and covers a specific topic with breadth and depth appropriate for a high-level graduate seminar.
Restriction: Permission of instructor.
Repeatable to: 9 credits if content differs.

COMM779 Seminar: Special Topics in Persuasion and Attitude Change (3 Credits)
This seminar explores special topic areas with the study of persuasion and attitude change, such as social cognition, humor, message production,and cognitive oscillation.
Recommended: COMM775.
Repeatable to: 9 credits if content differs.

COMM789 Seminar: Special Topics in Intercultural Communication (3 Credits)
Explores special topic areas within the study of intercultural communication, such as culture and conflict, intercultural negotiation, cross-cultural relationships.
Recommended: COMM683.
Repeatable to: 9 credits if content differs.

COMM798 Independent Study (1-3 Credits)
An individual course designed for intensive study or research of problems in communication.
Restriction: Permission of instructor.
Formerly: SPCH798.

COMM799 Master's Thesis Research (1-6 Credits)
Formerly: SPCH799.

COMM879 Special Research Problems in Persuasion and Attitude Change (1-4 Credits)
Directed team and individual research projects.
Prerequisite: Permission of ARHU-Communication department.
Repeatable to: 9 credits if content differs.

COMM888 Doctoral Practicum in Communication (3-9 Credits)
Analysis of professional activity through personal observation. Evaluation of the purpose, process, effectiveness, and efficiency of professional activity. Recommendations for training and further research.
Repeatable to: 9 credits if content differs.
Formerly: SPCH888.

COMM889 Doctoral Tutorial in Communication (3-9 Credits)
Individual research in communication.
Repeatable to: 9 credits if content differs.
Formerly: SPCH889.

COMM898 Pre-Candidacy Research (1-8 Credits)

COMM899 Doctoral Dissertation Research (1-8 Credits)
Formerly: SPCH899.

CONS - Sustainable Development & Conservation Biology

CONS608 Seminar in Sustainable Development and Conservation Biology (1-4 Credits)
Special topics and current literature in conservation biology and sustainable development.
Repeatable to: 6 credits if content differs.

CONS609 Special Topics in Conservation Biology (1-3 Credits)
Lectures, experimental courses and other special instructions in various subjects in conservation biology.
Repeatable to: 6 credits if content differs.

CONS798 Research Papers in Sustainable Development and Conservation Biology (1-4 Credits)
Work on the required scholarly paper.
Restriction: Must be in Sustainable Development & Conservation Biology (Master's) program.
Repeatable to: 4 credits if content differs.

DANC - Dance

DANC405 Dance Education II: Education & Policy (3 Credits)
Curricula in dance in K-12 settings, classroom management, assessment/grading, and best practices in dance education in public schools. Current research and policy issues are included. This course counts towards teacher certification in the State of Maryland.
Restriction: Permission of ARHU-Dance department.

DANC409 Contact Improvisation (2 Credits)
Discovery and cultivation of the principles and skills of Contact Improvisation dance technique.
Restriction: Permission of ARHU-School of Theatre, Dance & Performance Studies department.
Repeatable to: 4 credits.
Credit Only Granted for: DANC489C or DANC409.

DANC418 Contemporary Modern (2 Credits)
Physical practice that sources postmodern dance influences, endurance training, improvisation, and choreographic composition to present movement practices as a form of investigation.
Prerequisite: DANC218; or permission of instructor.
Repeatable to: 6 credits.
Credit Only Granted for: DANC418 or DANC489O.
Formerly: DANC489O.

DANC420 Partnering (2 Credits)
Elements of contemporary partnering including weight sharing, counter balancing, momentum/leverage, lifting and moving responsively.
Restriction: Permission of ARHU-Dance department.

DANC429 Advanced Ballet Technique II (1 Credit)
Intensive work in ballet technique for the professionally-oriented dancer.
Restriction: Permission of ARHU-School of Theatre, Dance & Performance Studies department.
Repeatable to: 3 credits.

DANC448 Modern Dance V (3 Credits)
Complex phrases of modern dance movement with emphasis on articulation and expression.
Prerequisite: DANC349; and must audition.
Repeatable to: 6 credits.

DANC449 Modern Dance VI (3 Credits)
Continuation of DANC448.
Prerequisite: DANC448; and permission of ARHU-School of Theatre, Dance & Performance Studies department.
Repeatable to: 6 credits.

DANC466 Laban Movement Analysis (3 Credits)
Introduction to Rudolf Laban's system of qualitative movement analysis in relation to understanding personal movement style. Application to dance performance, teaching, composition and research.

DANC468 Dance Repertory (3 Credits)
Form, content, music, design and performance of modern dance works.
Prerequisite: DANC349; and permission of ARHU-School of Theatre, Dance & Performance Studies department.
Repeatable to: 6 credits if content differs.

DANC469 Study Abroad Special Topics IV (1-6 Credits)
Special topics course taken as part of an approved study abroad program.
Repeatable to: 15 credits if content differs.

DANC479 Advanced Practicum in Dance (1-3 Credits)
Advanced level performing experience for the student dancer who has developed an advanced professional level of competence.
Repeatable to: 6 credits.

DANC485 Seminar in Dance (3 Credits)
Individual research leading to a presentation with written documentation of the process, serving as a culmination of undergraduate study for dance majors.
Prerequisite: DANC483.
Restriction: Must be in Dance program; and senior standing.

DANC488 Project-Based Learning (3 Credits)
A specific project, is addressed, in dance from the perspectives of the investigator, the creator/choreographer, and the performer. Projects are cross-disciplinary and/or cross-cultural, and may involve both on- and off-campus experiences.
Restriction: Permission of ARHU-Dance department.
Repeatable to: 6 credits if content differs.

DANC489 Special Topics in Dance (1-3 Credits)
Theoretical, choreographic, pedagogic, or performance study.
Restriction: Permission of ARHU-School of Theatre, Dance & Performance Studies department.
Repeatable to: 6 credits if content differs.

DANC499 Practicum in Choreography, Production and Performance IV (1-6 Credits)
Advanced workshop in dance presentation, including performing, production and planned field experiences.
Restriction: Permission of ARHU-School of Theatre, Dance & Performance Studies department.
Repeatable to: 6 credits.

DANC600 Graduate Dance Research (3 Credits)
Supervised writing of reports and articles on selected dance subjects. Study of library resources and interviewing techniques. Preparation for written documentation of thesis project.
Restriction: Permission of ARHU-School of Theatre, Dance & Performance Studies department.

DANC604 Graduate Studies in Dance Pedagogy (3 Credits)
Curriculum writing, lesson planning, class structure, assessment/grading, and practice in dance pedagogy. Includes preparation of syllabi and studio teaching practice. This course counts towards teaching ceritification in the State of Maryland.
Restriction: Must be admitted to MFA in Dance; or permission of ARHU-School of Theatre, Dance & Performance Studies department.

DANC606 Pedagogy Practicum (1 Credit)
An embodied laboratory where students deepen their teaching practices and develop new and innovative curricular formats and structures for their dance studio courses. Students will serve as an apprentice to faculty instructors of record teaching a course in order to deepen their understanding of course content delivery. The course culminates in the student developing their own syllabus for the course they have attended for the semester.
Restriction: Permission of department.

DANC608 Graduate Choreography I: Creative Process (3-6 Credits)
Developing and defining individual choreographic voice and vision in a shared studio setting.
Restriction: Must be admitted to MFA in Dance; or permission of ARHU-School of Theatre, Dance & Performance Studies department.
Repeatable to: 6 credits if content differs.

DANC610 Workshop in the Direction of Dance Production (1 Credit)
A lecture/laboratory course dealing with the relationship of the director to all of the activities involved in the presentation of a dance concert.
Prerequisite: DANC410; or students who have taken courses with comparable content may contact the department.

DANC611 Dance Technology and Media (1 Credit)
Project-based development of media and technological support for dance performance, archiving, and portfolio design, development and implementation.
Restriction: Permission of ARHU-School of Theatre, Dance & Performance Studies department.

DANC628 Graduate Ballet (1 Credit)
Execution of the vocabulary of ballet movement with technical accuracy.
Restriction: Permission of ARHU-School of Theatre, Dance & Performance Studies department.
Repeatable to: 4 credits.

DANC647 Dance and Movement Practice (2 Credits)
Experiential studio work that generates common movement vocabulary and innovations of same in a shared, faculty-led exploration of movement for the purpose of generating vocabulary for technique, choreography, and pedagogy.
Restriction: Permission of ARHU-School of Theatre, Dance & Performance Studies department.

DANC648 Advanced Modern Dance Technique I (1 Credit)
Professional level training in contemporary dance techniques.
Prerequisite: DANC449; or admitted to the MFA in Dance program, or students who have taken courses with comparable content may contact the department.
Repeatable to: 6 credits.

DANC649 Advanced Modern Dance Technique II (1 Credit)
A continuation of DANC 648.
Prerequisite: DANC648; or students who have taken courses with comparable content may contact the department.
Repeatable to: 6 credits.

DANC678 Individual Movement Practice (2 Credits)
Students in consultation with the adviser, propose a specific movement practice and can select the practice from the range of technique offerings in the program. Additional work in documenting and providing evidence of growth towards individual outcomes is required.
Prerequisite: Permission of ARHU-School of Theatre, Dance & Performance Studies department.
Repeatable to: 10 credits.

DANC679 Graduate Dance Performance (1 Credit)
An advanced performance course focusing on the restagings from noted scores of the choreographic works of significant artists in the field.
Restriction: Permission of ARHU-School of Theatre, Dance & Performance Studies department.
Repeatable to: 6 credits.

DANC689 Special Topics in Dance (1-6 Credits)
Special Topics in dance theory, research or creative projects.
Restriction: Permission of ARHU-School of Theatre, Dance & Performance Studies department.
Repeatable to: 12 credits if content differs.

DANC698 Independent Study in Dance (1-3 Credits)
Directed independent study in theoretical topics.
Restriction: Permission of ARHU-School of Theatre, Dance & Performance Studies department.
Repeatable to: 6 credits.

DANC699 Thesis Writing Lab (1 Credit)
The final writing project in MFA dance degree demonstrates students' ability to write critically about their creative work in relation to the dance field at large. A successful written thesis demonstrates a familiarity with concepts from dance history and critical theory as well as an ability to analyze movement and choreography. During the thesis writing lab, each student organizes ideas and establishes individual goals for the written project.
Repeatable to: 3 credits.
Formerly: DANC689W.

DANC708 Graduate Choreography II: Collaboration (3-6 Credits)
Collaborative work across disciplines and genres.
Restriction: Must be admitted to MFA in Dance; or permission of ARHU-School of Theatre, Dance & Performance Studies department.
Repeatable to: 6 credits.

DANC719 Graduate Choreography III: Projects (3 Credits)
Research-based choreographic projects in preparation for the choreographed thesis project.
Restriction: Must be admitted to MFA in Dance; or permission of ARHU-School of Theatre, Dance & Performance Studies department.
Repeatable to: 6 credits.

DANC766 Graduate Movement Observation and Analysis (3 Credits)
Aspects of cultural and nonverbal analysis, developmental movement, kinesiological analysis, Laban Movement Analysis, with the goal of developing the student/teacher's ability to observe macro and micro levels of detail.
Restriction: Must be admitted to MFA in Dance; or permission of ARHU-School of Theatre, Dance & Performance Studies department.

DANC777 Internship in Dance (1-5 Credits)
Internship in dance advocacy, administration, education, community building, choreography, or performance with an agency off campus and with a national or international profile.
Restriction: Must be admitted to MFA in Dance; or permission of ARHU-School of Theatre, Dance & Performance Studies department.

DANC779 Master's Tutorial for Performance (1 Credit)
Supervised performance experience for advanced dancers.
Restriction: Permission of ARHU-School of Theatre, Dance & Performance Studies department.
Repeatable to: 6 credits.

DANC784 Dance in a Global Context (3 Credits)
Topics that illuminate dance in global context and provides an overview of methods, challenges and perspectives to the study of dance cross-culturally will be considered. Simultaneously, surveys select dance practices spanning many geographical areas, and offers insight into the diverse social, cultural, religious, and political environments from which dance extends.
Restriction: Must be admitted to MFA in Dance; or permission of ARHU-School of Theatre, Dance & Performance Studies department.

DANC788 Master's Tutorial for Choreography (1-3 Credits)
Supervised production and presentation of a significant choreographic project.
Restriction: Permission of ARHU-School of Theatre, Dance & Performance Studies department.
Repeatable to: 6 credits.

DANC789 Directed Study in Dance Theory (2-6 Credits)
Advanced directed study in dance history, theory or criticism culminating in a paper for presentation or publication.
Repeatable to: 6 credits if content differs.

DANC799 Master's Thesis Project (1-6 Credits)
Restriction: Permission of ARHU-School of Theatre, Dance & Performance Studies department.

DATA - Data

DATA400 Applied Probability and Statistics I (3 Credits)
Random variables, standard distributions, moments, law of large numbers and central limit theorem. Sampling methods, estimation of parameters, testing of hypotheses.
Prerequisite: 1 course with a minimum grade of C- from (MATH131, MATH141); or students who have taken courses with comparable content may contact the department.
Cross-listed with: STAT400.
Credit Only Granted for: DATA400, ENEE324, or STAT400.
Additional Information: Not acceptable toward graduate degrees in MATH/STAT/AMSC.

DATA601 Probability and Statistics (3 Credits)
Provides a solid understanding of the fundamental concepts of probability theory and statistics. The course covers the basic probabilistic concepts such as probability space, random variables and vectors, expectation, covariance, correlation, probability distribution functions, etc. Important classes of discrete and continuous random variables, their inter-relation, and relevance to applications are discussed. Conditional probabilities, the Bayes formula, and properties of jointly distributed random variables are covered. Limit theorems, which investigate the behavior of a sum of a large number of random variables, are discussed. The main concepts random processes are then introduced. The latter part of the course concerns the basic problems of mathematical statistics, in particular, point and interval estimation and hypothesis testing.
Prerequisite: Undergraduate courses in calculus and basic linear algebra.
Cross-listed with: BIOI601, MSAI601, MSML601.
Credit Only Granted for: BIOI601, DATA601, MSAI601 or MSML601.

DATA602 Principles of Data Science (3 Credits)
An introduction to the data science pipeline, i.e., the end-to-end process of going from unstructured, messy data to knowledge and actionable insights. Provides a broad overview of what data science means and systems and tools commonly used for data science, and illustrates the principles of data science through several case studies.
Cross-listed with: BIOI602, MSAI602, MSML602.
Restriction: Must be in one of the following programs: (Data Science Post-Baccalaureate Certificate, Master of Professional Studies in Data Science and Analytics, or Master of Professional Studies in Machine Learning).
Credit Only Granted for: BIOI602, DATA602, MSAI602, MSML602 or CMSC641.
Formerly: CMSC641.

DATA603 Principles of Machine Learning (3 Credits)
A broad introduction to machine learning and statistical pattern recognition. Topics include: Supervised learning: Bayes decision theory, discriminant functions, maximum likelihood estimation, nearest neighbor rule, linear discriminant analysis, support vector machines, neural networks, deep learning networks. Unsupervised learning: clustering, dimensionality reduction, PCA, auto-encoders. The course will also discuss recent applications of machine learning, such as computer vision, data mining, autonomous navigation, and speech recognition.
Cross-listed with: BIOI603, MSAI603, MSML603, MSQC603.
Restriction: Must be in one of the following programs: (Data Science Post-Baccalaureate Certificate, Master of Professional Studies in Data Science and Analytics, or Master of Professional Studies in Machine Learning).
Credit Only Granted for: BIOI603, DATA603, MSAI603, MSML603, MSQC603 or CMSC643.
Formerly: CMSC643.

DATA604 Data Representation and Modeling (3 Credits)
An introductory course connecting students to the most recent developments in the field of data science. It covers several fundamental mathematical concepts which form the foundations of Big Data theory. Among the topics included are Principal Component Analysis, metric learning and nearest neighbor search, elementary spectral graph theory, minimum and maximum graph cuts, graph partitions, Laplacian Eigenmaps, manifold learning and dimension reduction concepts, clustering and classification techniques such as k-means, kernel methods, Mercer's theorem, and Support Vector Machines. Some relevant concepts from geometry and topology will be also covered.
Prerequisite: DATA601 or MSML601.

DATA605 Big Data Systems (3 Credits)
An overview of data management systems for performing data science on large volumes of data, including relational databases, and NoSQL systems. The topics covered include: different types of data management systems, their pros and cons, how and when to use those systems, and best practices for data modeling.
Prerequisite: DATA602.
Restriction: Must be in the Data Science Post-Baccalaureate Certificate of Professional Studies or Master of Professional Studies in Data Science and Analytics program.
Credit Only Granted for: DATA605 or CMSC642.
Formerly: CMSC642.

DATA606 Algorithms for Data Science (3 Credits)
Provides an in-depth understanding of some of the key data structures and algorithms essential for advanced data science. Topics include random sampling, graph algorithms, network science, data streams, and optimization.
Prerequisite: DATA602.
Restriction: Must be in the Data Science Post-Baccalaureate Certificate of Professional Studies or Master of Professional Studies in Data Science and Analytics program.
Credit Only Granted for: DATA606 or CMSC644.
Formerly: CMSC644.

DATA607 Communication in Data Science and Analytics (3 Credits)
Expected learning outcomes include that, in the context of data science and analytics, students should be able to: summarize, report, organize prose, statistics, graphics, and presentations; explain uncertainty, sensitivity/robustness, limitations; describe model generation and representation; discuss interpretations and implications; communicate effectively to diverse audiences within a business organization, and possibly other outcomes.
Prerequisite: DATA602.

DATA612 Deep Learning (3 Credits)
Provides an introduction to the construction and use of deep neural networks: models that are composed of several layers of nonlinear processing. The class will focus on the main features in deep neural nets structures. Specific topics include backpropagation and its importance to reduce the computational cost of the training of the neural nets, various coding tools available and how they use parallelization, and convolutional neural networks. Additional topics may include autoencoders, variational autoencoders, convolutional neural networks, recurrent and recursive neural networks, generative adversarial networks, and attention-based models. The concepts introduced will be illustrated by examples of applications chosen among various classification/clustering questions, computer vision, natural language processing.
Prerequisite: DATA603 or MSML603.
Cross-listed with: MSAI612, MSML612.
Credit Only Granted for: DATA612, MSAI612 or MSML612.

DATA640 Computer Vision (3 Credits)
An introduction to basic concepts and techniques in computer vision. Topics include low-level operations such as image filtering, correlation, edge detection and Fourier analysis. Image segmentation, texture and color analysis. Perspective, cameras and 3D reconstruction of scenes using stereo and structure from motion. Deep learning for object detection, recognition and classification in images and video.
Prerequisite: BIOI603, DATA603, or MSML603.
Cross-listed with: MSML640, MSAI640.
Credit Only Granted for: MSML640, MSAI640 or DATA640.

DATA641 Natural Language Processing (3 Credits)
Introduces fundamental concepts and techniques involved in getting computers to deal more intelligently with human language. Focused primarily on text (as opposed to speech), the class will offer a grounding in core NLP methods for text processing (such as lexical analysis, sequential tagging, syntactic parsing, semantic representations, text classification, unsupervised discovery of latent structure), key ideas in the application of deep learning to language tasks, and consideration of the role of language technology in modern society.
Prerequisite: DATA603 or MSML603.
Cross-listed with: MSAI641, MSML641.
Credit Only Granted for: DATA641, MSAI641 or MSML641.

DATA650 Cloud Computing (3 Credits)
Presents the state of the art in cloud computing technologies and applications. Topics will include: telecommunications needs, architectural models for cloud computing, cloud computing platforms and services. Data center networking, server, network and storage virtualization technologies, and containerization. Cloud operating and orchestration systems. Security, privacy, and trust management; resource allocation and quality of service; interoperability and internetworking.
Cross-listed with: MSML650.
Credit Only Granted for: MSML650 or DATA650.

DATA698 Research Methods and Study Design (3 Credits)
Expected learning outcomes include that students should be able to: compose problem specifications relevant to work environment, create project descriptions, determine data and resource requirements, propose appropriate methods analytical methods, construct research plans; determine reporting requirements appropriate to various employment situations, identify intended audiences and uses, propose supporting documentation, and possibly other outcomes. Includes ethical and legal considerations in data science.
Restriction: Must have completed at least 4 courses in the program.

DATA699 Capstone Research Project (3 Credits)
The capstone project provides students with an opportunity to integrate and apply the core knowledge and skills acquired throughout the data science program in a real-world, project-driven setting. All projects must be new and completed specifically for this capstone course under faculty supervision. Students will choose a project reflecting their domain interest (and perhaps of professional or research relevance). The course instructor will provide guidance to set appropriate expectations, scope, and methodological rigor. Students will conduct a comprehensive data science project applicable to organizational or research objectives; apply the full data science workflow,; and develop a professional written report and other technical deliverables.
Prerequisite: DATA601, DATA602, and DATA603.
Restriction: Must have completed at least four courses in Data Science MS program.

ECON - Economics

ECON401 Current Issues in American Economic Policy (3 Credits)
Analysis of current economic problems and public policies. Topics could include poverty, income inequality, social insurance, education, environmental sustainability, immigration, and innovation. Other issues may be substituted depending on current events.
Prerequisite: 1 course with a minimum grade of C- from (ECON305, ECON325); and 1 course with a minimum grade of C- from (ECON306, ECON326); and 1 course with a minimum grade of C- from (ECON424, ECON422).
Restriction: Permission of BSOS-Economics department; and must be in one of the following programs (Economics Bachelor of Arts; Economics minor; Social Data Science-Economics).

ECON402 Macroeconomic Models and Forecasting (3 Credits)
Analysis of the fluctuations in economic activity and the formulation and use of forecasting models of the economy. Illustrations of computer macro models and forecasting problems.
Prerequisite: 1 course with a minimum grade of C- from (ECON305, ECON325); and 1 course with a minimum grade of C- from (ECON230, BMGT230, ECON321).
Restriction: Must be in one of the following programs (Economics Bachelor of Arts; Economics minor; Social Data Science-Economics).

ECON406 Advanced Microeconomics (3 Credits)
Expands on the assumptions of rational decision-making used in intermediate microeconomics and develops more complicated, more realistic models which address uncertainty, intertemporal choices, strategic interactions, social preferences and considerations of what is fair.
Prerequisite: Minimum grade of C- in ECON326; and 1 course with a minimum grade of C- from (ECON321, STAT401).
Restriction: Must be in one of the following programs (Economics Bachelor of Science; Economics minor).

ECON407 Advanced Macroeconomics (3 Credits)
An in-depth analysis of current issues in macroeconomic theory and policy. Topics covered include: 1. alternative perspectives on macroeconomics including monetarism, new classical equilibrium models, rational expectations, and real business cycle models; 2. long term growth, the slowdown in productivity growth, and concerns about U.S. competitiveness; 3. the effectiveness of macroeconomic policy in an open economy; 4. the effects of finance on the real sector.
Prerequisite: Minimum grade of C- in ECON325; and 1 course with a minimum grade of C- from (ECON321, STAT401).
Restriction: Must be in one of the following programs (Economics Bachelor of Science; Economics minor).

ECON410 Comparative Economic Institutions (3 Credits)
Institutions are the sets of rules that constrain the decisions and interactions of economic agents. The course uses economic analysis to understand both formal institutions (e.g. laws) and informal institutions (e.g. cultural norms). Practical examples are drawn from economics, law, and politics, and reflect the experience of many different countries.
Prerequisite: Minimum grade of C- in ECON325 and ECON326; and 1 course with a minimum grade of C- from (ECON321, STAT401).
Restriction: Must be in one of the following programs (Economics Bachelor of Science; Economics minor).

ECON412 Economic History and Modern Development (3 Credits)
Analysis of major economic, political, and social change in the developed world since 1800. This includes factors contributing to increases in economic performance, changes in the form of government, technological change (including industrialization), and integration and disintegration of the global economy. Emphasis is on institutional changes in how societies organize economic and political activities.
Prerequisite: Minimum grade of C- in ECON325 and ECON326.
Restriction: Must be in one of the following programs (Economics Bachelor of Science; Economics minor).

ECON414 Game Theory (3 Credits)
Studies the competitive and cooperative behavior that results when several parties find that their individual outcomes are jointly determined. Students will learn how to use game theory to analyze situations of potential conflict. Applications are drawn from economics, business, and political science.
Prerequisite: 1 course with a minimum grade of C- from (ECON306, ECON326); and 1 course with a minimum grade of C- from (ECON230, BMGT230, ECON321, STAT401).
Restriction: Must be in one of the following programs (Economics Bachelor of Arts; Economics Bachelor of Science; Economics minor).
Credit Only Granted for: CMSC474, ECON414, GVPT399A or GVPT390.

ECON415 Market Design (3 Credits)
Focuses on recent developments in the design of markets to improve economic performance and to open new economic opportunities. It is divided into three main segments -- auction design, the design of matching mechanisms, and antitrust theory and policy.
Prerequisite: Minimum grade of C- in ECON414.
Restriction: Must be in one of the following programs (Economics Bachelor of Science; Economics minor).

ECON416 Analysis of Economic Development (3 Credits)
Analysis of the determinants and influences on economic development. Emphasis on both theoretical models and econometric methods of explaining why some countries are poor, along with examination of policies to promote development.
Prerequisite: Minimum grade of C- in ECON325, ECON326, and ECON422.
Restriction: Must be in one of the following programs (Economics Bachelor of Science; Economics minor).
Credit Only Granted for: ECON315 or ECON416.

ECON417 Estimating Policy and Program Impact (3 Credits)
Governments, businesses, non-profits, funders, and other organizations must allocate scarce resources between competing uses. Understanding the causal effect of policies, programs or investments on key outcomes can guide the choices of these decision-makers. Correlations between policies and outcomes or changes in outcomes after new policies are adopted are rarely sufficient for estimating the causal effect, however. This course focuses on econometric strategies for obtaining unbiased causal estimates, including experimental methods, instrumental variables, regression discontinuity, and differences-in-differences. There will be an emphasis on using Stata and on interpreting the results of econometric analysis
Prerequisite: 1 course with a minimum grade of C- from (ECON306, ECON326) and 1 course with a minimum grade of C- from (ECON424, ECON422).
Restriction: Permission of BSOS-Economics department; and must be in one of the following programs (Economics Bachelor of Arts; Economics Bachelor of Science; Economics minor; Social Data Science-Economics).

ECON418 Economic Development of Selected Areas (3 Credits)
Economic and institutional characteristics of a specific geographic area are identified and discussed, and alternate strategies and policies for development are analyzed.
Prerequisite: 1 course with a minimum grade of C- from (ECON305, ECON306, ECON325, ECON326); and 1 course with a minimum grade of C- from (ECON230, BMGT230, ECON321).
Restriction: Must be in one of the following programs (Economics Bachelor of Arts; Economics minor; Social Data Science-Economics).
Repeatable to: 6 credits if content differs.

ECON422 Econometrics (3 Credits)
Emphasizes the interaction between economic problems and the assumptions employed in statistical theory. Formulation, estimation, and testing of economic models, including single variable and multiple variable regression techniques, theory of identification, and issues relating to inference.
Prerequisite: 1 course with a minimum grade of C- from (ECON325, ECON326); and 1 course with a minimum grade of C- from (ECON321, STAT401).
Restriction: Must be in one of the following programs (Economics Bachelor of Science; Economics minor).
Credit Only Granted for: ECON422, ECON424, or AREC422.

ECON423 Advanced Topics in Econometrics (3 Credits)
Interaction between economic problems and specification and estimation of econometric models. Topics may include: autocorrelation, heteroscedasticity, functional form, simultaneous equation models, logit and probit models, instrumental variables, qualitative choice models, and other computational methods.
Prerequisite: Minimum grade of C- in ECON422.
Restriction: Must be in one of the following programs (Economics Bachelor of Science; Economics minor).

ECON424 Applied Econometrics (3 Credits)
Provide the knowledge and skills necessary to accomplish and utilize basic applied econometric analysis utilized by many business service providers, government agencies, and nonprofits engaged in policy analysis. Topics include simple and multiple regressions using cross section, time series, and panel data, issues of heteroskedasticity, serial correlation, and multicollinearity, models with binary dependent variable, and program evaluation. Course emphasizes application of knowledge using software packages but still covers essential theoretical background.
Prerequisite: 1 course with a minimum grade of C- from (ECON305, ECON306, ECON325, ECON326); and 1 course with a minimum grade of C- from (ECON230, BMGT230, ECON321).
Restriction: Must be in one of the following programs (Economics Bachelor of Arts; Economics minor; Social Data Science-Economics).
Credit Only Granted for: ECON422, ECON424 or AREC422.

ECON425 Mathematical Economics (3 Credits)
Covers mathematical tools and skills utilized in upper undergraduate and master's level coursework in Economics and Public Policy. Reviews calculus and math of finance and growth. Introduces techniques of optimization, linear algebra, and differential equations and connects them to micro and macro theory and applications. Topics will also include coverage of probability theory to explore how economists model uncertainty, as well as economic applications of integration.
Prerequisite: 1 course with a minimum grade of C- from (ECON305, ECON325); and 1 course with a minimum grade of C- from (ECON306, ECON326).
Restriction: Must be in one of the following programs (Economics Bachelor of Arts; Economics minor; Social Data Science-Economics).

ECON426 Economics of Cost-Benefit Analysis (3 Credits)
Study of how to use cost benefit analysis and other similar tools of applied microeconomics to conduct policy analyses. Cost-benefit analysis is an empirical method of identifying an optimal choice from a set of policy alternatives, where optimal is defined in terms of economic efficiency. Real world examples are addressed, so that students understand limitations of the methods and also interactions of economic analysis with political and administrative processes.
Prerequisite: 1 course with a minimum grade of C- from (ECON305, ECON306, ECON325, ECON326); and 1 course with a minimum grade of C- from (ECON230, BMGT230, ECON321).
Restriction: Must be in one of the following programs (Economics Bachelor of Arts; Economics minor; Social Data Science-Economics).

ECON427 Experimental Economics (3 Credits)
An introduction to the methodology of experimental economics and its application to issues such as decision-making under uncertainty, auctions, and public goods. Also an introduction to behavioral economics as a relatively new area of economic research.
Prerequisite: Minimum grade of C- in ECON326; and 1 course with a minimum grade of C- from (ECON321, STAT401).
Restriction: Must be in one of the following programs (Economics Bachelor of Science; Economics minor).

ECON432 Applied Machine Learning (4 Credits)
Offers a comprehensive examination of the concepts and techniques used in machine learning, with a specific emphasis on their applications in economics. Focuses on the practical aspects of machine learning, including the use of different methods, model selection, and performance evaluation. Students will explore both supervised and unsupervised learning techniques, such as linear and non-linear regression, k-nearest neighbors, tree-based approaches, support vector machines, neural networks, and dimensionality reduction methods. Additional advanced methods may be covered, depending on the time available. Hands-on implementation of these techniques will be conducted using the R programming language.
Prerequisite: 1 course with a minimum grade of C- from (ECON422, ECON424).
Restriction: Permission of BSOS-Economics department; and must be in one of the following programs (Economics Bachelor of Arts; Economics Bachelor of Science; Economics minor; Social Data Science-Economics).

ECON433 Economics of Big Data (4 Credits)
The importance of big data in the global economy is rising. Students will explore the definition and characteristics of big data, the impact of big data on individuals, use of big data by firms, entrepreneurs and non-profits, as well as how big data reshapes various public policies.
Prerequisite: 1 course with a minimum grade of C- from (ECON306, ECON326); and 1 course with a minimum grade of C- from (ECON230, BMGT230, ECON321, STAT401).
Restriction: Must be in one of the following programs (Economics Bachelor of Arts; Economics Bachelor of Science; Economics minor; Social Data Science-Economics).

ECON434 The Economics of Information and Uncertainty (3 Credits)
How do rational agents make decisions when faced with uncertainty? How do markets and other institutions deal with risks? How do markets behave when some actors are better informed than others? What incentives influence whether economic decision-makers hide or reveal information? Topics include the value of information, the purchase of warranties, agency problems in management, adverse selection and moral hazard in insurance, and signaling in education.
Prerequisite: 1 course with a minimum grade of C- from (ECON306, ECON326); and 1 course with a minimum grade of C- from (ECON230, BMGT230, ECON321, STAT401).
Restriction: Must be in one of the following programs (Economics Bachelor of Arts; Economics Bachelor of Science; Economics minor; Social Data Science-Economics).
Credit Only Granted for: ECON498U or ECON434.
Formerly: ECON498U.

ECON435 Financial Markets and the Macroeconomy (3 Credits)
Provides students with the necessary tools to understand financial decisions investors and firms make. The course will cover two of the main areas of financial economics: Asset pricing and corporate finance. Asset pricing topics include the valuation of bonds, stocks, derivatives, portfolio decisions, and arbitrage. Corporate finance topics include the valuation of investment projects, the cost of capital, capital structure, and financial distress.
Prerequisite: 1 course with a minimum grade of C- from (ECON305, ECON325); and 1 course with a minimum grade of C- from (ECON306, ECON326); and 1 course with a minimum grade of C- from (ECON230, BMGT230, ECON321, STAT401).
Restriction: Must be in one of the following programs (Economics Bachelor of Arts; Economics Bachelor of Science; Economics minor; Social Data Science-Economics).
Credit Only Granted for: BMGT343 or ECON435.
Additional Information: Finance majors will not receive credit for ECON435.

ECON442 Globalization and Capital Markets (3 Credits)
Uses models of open-economy macroeconomics to explain the causes and consequences of international capital flows. Analysis is made of private consumption, investment, the government sector, current accounts, the labor market, and the money and foreign exchange markets in small open economies. This framework is then used to study examples of how speculative attacks on currencies, sudden reversals of capital inflows, and the effects of the lack of credibility of economic policy affect economic development.
Prerequisite: Minimum grade of C- in ECON326 and ECON325; and 1 course with a minimum grade of C- from (ECON321, STAT401).
Restriction: Must be in one of the following programs (Economics Bachelor of Science; Economics minor); and must not have completed ECON441.
Credit Only Granted for: ECON441 or ECON442.

ECON443 International Trade and Trade Policy in the New Global Economy (3 Credits)
Examines the economics of international economic integration, including the theory of customs unions and free trade areas, the role of GATT and the WTO, changes in individual countries' foreign trade policies during the new era of globalization, the special role of multinational firms in world trade, and recent controversies about the benefits and costs of globalized trade.
Prerequisite: 1 course with a minimum grade of C- from (ECON305, ECON325); and 1 course with a minimum grade of C- from (ECON306, ECON326); and 1 course with a minimum grade of C- from (ECON230, BMGT230, ECON321).
Restriction: Must be in one of the following programs (Economics Bachelor of Arts; Economics minor; Social Data Science-Economics); and must not have completed ECON441.
Credit Only Granted for: ECON441 or ECON443.

ECON451 Public Choice (3 Credits)
Analysis of collective decision making, economic models of government, program budgeting, and policy implementation; emphasis on models of public choice and institutions which affect decision making.
Prerequisite: 1 course with a minimum grade of C- from (ECON306, ECON326); and 1 course with a minimum grade of C- from (ECON230, BMGT230, ECON321).
Restriction: Must be in one of the following programs (Economics Bachelor of Arts; Economics minor; Social Data Science-Economics).

ECON453 Natural Resources and Public Policy (3 Credits)
Rational use and reuse of natural resources. Theory, methodology, and policies concerned with the allocation of natural resources among alternative uses. Optimum state of conservation, market failure, safe minimum standard, and cost-benefit analysis.
Prerequisite: AREC326, ECON306, or ECON326; and (BMGT230 or ECON230).
Cross-listed with: AREC453.
Restriction: Must be in one of the following programs (Agricultural and Resource Economics; Agricultural and Resource Economics: Agribusiness; Agricultural and Resource Economics: Environmental and Resource Economics; Economics Bachelor of Arts; Environmental Science & Policy-Env Economics; Social Data Science-Economics; Economics minor).
Credit Only Granted for: AREC453 or ECON453.

ECON454 Public Finance and Public Policy (3 Credits)
The role of the the public sector in a market economy constitutes the over-arching topic of this course. Emphasis lies on analyzing government expenditure programs and the microeconomics of tax policy.
Prerequisite: 1 course with a minimum grade of C- from (ECON306, ECON326); and 1 course with a minimum grade of C- from (ECON230, BMGT230, ECON321 or STAT401).
Restriction: Must be in one of the following programs (Economics Bachelor of Arts; Economics Bachelor of Science; Economics minor; Social Data Science-Economics).

ECON455 Economics of Education Policy (3 Credits)
Examines the role that government plays in providing and financing education. Analyzes why people invest in education. Considers the effects of education on long-term social and economic outcomes, the behavior of institutions that produce education, and how to design and implement public policies affecting the level and distribution of educational resources. Uses microeconomic models and empirical findings to analyze current issues in education policy.
Prerequisite: 1 course with a minimum grade of C- from (ECON306, ECON326); and 1 course with a minimum grade of C- from (ECON230, BMGT230, ECON321).
Restriction: Must be in one of the following programs (Economics Bachelor of Arts; Economics minor; Social Data Science-Economics).
Credit Only Granted for: ECON468E or ECON455.
Formerly: ECON468E.

ECON456 Law and Economics (3 Credits)
Relationship of the exchange process to the system of institutions and rules that society develops to carry out economic transactions. Topics covered include: Property rights; torts, negligence, and liability; contracts and exchanges; criminal control and enforcement; equity and efficiency issues .
Prerequisite: 1 course with a minimum grade of C- from (ECON306, ECON326); and 1 course with a minimum grade of C- from (ECON230, BMGT230, ECON321).
Restriction: Must be in one of the following programs (Economics Bachelor of Arts; Economics minor; Social Data Science-Economics).

ECON458 Special Topics in Study Abroad IV (1-6 Credits)
Special topics course taken as part of an approved study abroad program.
Prerequisite: At least one intermediate theory course and/or statistics.
Repeatable to: 15 credits if content differs.

ECON460 Industrial Organization (3 Credits)
Examines different theoretical models of firm behavior in markets with varying amounts of market power. Relates theory to specific industries and examines how market structure evolves over time.
Prerequisite: Minimum grade of C- in ECON326; and 1 course with a minimum grade of C- from (ECON321, STAT401).
Restriction: Must be in one of the following programs (Economics Bachelor of Science; Economics minor).

ECON461 Economics of Regulation and Antitrust (3 Credits)
Considers government intervention in economic activity of three types: antitrust policy, regulation of natural monopolies, and health safety regulation. Covers theoretical models, real-world policy applications, and empirical studies relevant to the impact of regulation.
Prerequisite: 1 course with a minimum grade of C- from (ECON306, ECON326); and 1 course with a minimum grade of C- from (ECON230, BMGT230, ECON321).
Restriction: Must be in one of the following programs (Economics Bachelor of Arts; Economics minor; Social Data Science-Economics).

ECON465 Health Economics (3 Credits)
An examination of the structure, conduct and performance of the health care market, including a study of physician services, the pharmaceutical industry, the hospital market and health insurance. Students will analyze markets for health care and related products by examining the incentives and constraints for various participants, including individuals, family units, doctors, pharmaceutical companies, hospitals, and insurance providers. Analysis will combine both theoretical models and empirical tools.
Prerequisite: 1 course with a minimum grade of C- from (ECON306, ECON326); and 1 course with a minimum grade of C- from (ECON230, BMGT230, ECON321, STAT401).
Jointly offered with: ECON671.
Restriction: Must be in one of the following programs (Economics Bachelor of Arts; Economics Bachelor of Science; Economics minor; Social Data Science-Economics).
Credit Only Granted for: ECON465 or ECON671.

ECON468 Special Topics in Applied Economics (3 Credits)
Selected topics in applied economics. Designed to meet the changing interests of students and staff.
Prerequisite: 1 course with a minimum grade of C- from (BMGT230, ECON230); and 1 course with a minimum grade of C- from (ECON305, ECON306).
Restriction: Must be in one of the following programs (Economics Bachelor of Arts; Economics minor; Social Data Science-Economics).
Repeatable to: 15 credits if content differs.

ECON470 Labor Economics: Theory and Evidence (3 Credits)
Analysis of labor markets in theory and the real world. Topics include labor supply, labor demand, human capital, performance incentives, unemployment, discrimination, and immigration. Students will develop an understanding of how formal economic research is used to analyze U.S. labor markets and how research influences policy debates.
Prerequisite: 1 course with a minimum grade of C- from (ECON306, ECON326); and 1 course with a minimum grade of C- from (ECON230, BMGT230, ECON321, STAT401).
Restriction: Must be in one of the following programs (Economics Bachelor of Arts; Economics Bachelor of Science; Economics minor; Social Data Science-Economics).
Credit Only Granted for: ECON470 or ECON471.

ECON472 Economics of Social Safety Nets (3 Credits)
Analysis of the economic issues associated with social safety nets. Topics to be covered include the cash transfer programs for breaking the cycle of poverty, labor market policies aimed at combating unemployment, childhood interventions to improve human capital development, and the challenges faced by pension systems over the world. The approach is based on a life-cycle perspective. Evidence and experiences from developed and developing countries will covered.
Prerequisite: 1 course with a minimum grade of C- from (ECON306, ECON326); and minimum grade of C- in ECON424.
Restriction: Permission of BSOS-Economics department; and must be in one of the following programs (Economics Bachelor of Arts; Economics minor; Social Data Science-Economics).

ECON481 Environmental Economics (3 Credits)
An exploration of the use of economic incentives for protection of the environment and the determination of appropriate (or efficient) level of environmental quality. Also covers the choice of policy instruments for the attainment of environmental standards.
Prerequisite: 1 course with a minimum grade of C- from (AREC326, ECON306, ECON326); and 1 course with a minimum grade of C- from (ECON230, ECON321, BMGT230).
Cross-listed with: AREC481.
Restriction: Must be in one of the following programs (Agricultural and Resource Economics; Agricultural and Resource Economics: Agribusiness; Agricultural and Resource Economics: Environmental and Resource Economics; Economics Bachelor of Arts; Environmental Science & Policy-Env Economics; Social Data Science-Economics; Economics minor).
Credit Only Granted for: ECON481 or AREC481.

ECON484 The Economics of Climate Change (3 Credits)
The role of economics in the formation of climate policy; basic concepts of environmental economics including efficiency, externalities, and policy instruments; economic models of intertemporal decisions and decision making in the face of uncertainty. Applied economic analysis of specific issues and current policy initiatives.
Prerequisite: 1 course with a minimum grade of C- from (AREC326, ECON306, ECON326); and 1 course with a minimum grade of C- from (ECON230, ECON321, BMGT230).
Cross-listed with: AREC454.
Credit Only Granted for: AREC454 or ECON484.

ECON485 Economics of Land Use (3 Credits)
Fundamentals of location theory. Microeconomics of land use decisions, including determination of rent and hedonic pricing models. Impacts of government decisions on land use, including regulation (e.g., zoning), incentives (transferable development rights), provision of public services, and infrastructure investments. Impacts of land use on environmental quality, including issues relating to sprawl, agricultural land preservation, and other topics of special interest.
Prerequisite: 1 course with a minimum grade of C- from (AREC326, ECON306, ECON326); and 1 course with a minimum grade of C- from (ECON230, ECON321, BMGT230).
Cross-listed with: AREC455.
Credit Only Granted for: AREC455 or ECON485.

ECON486 Energy and Environmental Economics (3 Credits)
Economic theory and empirical methods are used to study problems of energy, the environment, and the economy. It examines the extraction, production, and use of energy and market institutions and regulatory approaches used to correct market failures. Topics covered include: oil and natural gas markets, management and design of electricity markets, renewable energy, non-market valuation , climate change, and transportation policies.
Prerequisite: 1 course with a minimum grade of C- from (AREC326, ECON306, ECON326); and 1 course with a minimum grade of C- from (ECON230, ECON321, BMGT230).
Cross-listed with: AREC456.
Credit Only Granted for: AREC456 or ECON486.

ECON488 Applied Research Practicum (1-3 Credits)
Students gain experience applying economic knowledge and producing research valued by businesses, non-profits, and/or government agencies. Students engage in activities similar to what an intern or entry-level employee would perform. Students work in small groups to find different kinds of data and facts, analyze and interpret this information, and use research findings to develop and present recommendations for simulated clients.
Prerequisite: 1 course with a minimum grade of B- from (BMGT230, ECON321, ECON230); and 1 course with a minimum grade of C- from (ECON305, ECON325); and 1 course with a minimum grade of C- from (ECON306, ECON326).
Recommended: ECON422, ECON402, or ECON424.
Restriction: Permission of BSOS-Economics department.
Repeatable to: 6 credits if content differs.

ECON489 Applied Economics Practicum (1-3 Credits)
Students gain experience explaining economic knowledge to people who have not studied economics. Students engage in activities preparing them for careers in banking, business consulting, financial education, wealth management, and related services.
Restriction: Permission of BSOS-Economics department.
Repeatable to: 6 credits if content differs.

ECON490 Urban & Regional Economics: Issues and Policies (3 Credits)
Exploration of urban and regional economics and policies, including economic forces leading to formation of city and regional networks. Conceptual and empirical analysis of policies affecting land use, housing, transportation and other aspects of sub-national economic development.
Prerequisite: 1 course with a minimum grade of C- from (ECON306, ECON326); and 1 course with a minimum grade of C- from (ECON321, BMGT230, ECON230).
Restriction: Must be in one of the following programs (Economics Bachelor of Arts; Economics minor; Social Data Science-Economics).
Credit Only Granted for: ECON398I or ECON490.
Formerly: ECON398I.

ECON498 Special Topics in Economic Analysis (3 Credits)
Selected topics in economic analysis. Designed to meet the changing interests of students and staff.
Prerequisite: 1 course with a minimum grade of C- from (ECON321, STAT401); and 1 course with a minimum grade of C- from (ECON325, ECON326).
Restriction: Must be in Economics Bachelor of Science program.
Repeatable to: 15 credits if content differs.

ECON499 Independent Research in Economics (1-3 Credits)
Directed research under the supervision of a faculty member. Contact department for additional information.
Prerequisite: 1 course with a minimum grade of C- from (ECON230, ECON321, BMGT230, STAT400); and 1 course with a minimum grade of C- from (ECON305, ECON325); and 1 course with a minimum grade of C- from (ECON306, ECON326); and minimum of 3 credits from ECON400-499 course range.
Restriction: Permission of BSOS-Economics department.
Repeatable to: 6 credits if content differs.

ECON601 Macroeconomic Analysis I (3 Credits)
Introductory technical treatment of standard Keynesian, classical and new classical macroeconomic models. Expectations formation and microeconomic foundations of consumption, investment, money demand, and labor market behavior.
Restriction: Permission of BSOS-Economics department.

ECON602 Macroeconomic Analysis II (3 Credits)
Further issues regarding macroeconomic topics. First half emphasis will be placed on dynamic macroeconomic theory as pertaining to monetary issues, policy ineffectiveness and effectiveness. The second half of the course will focus on theories of investment and growth.
Prerequisite: ECON601; or permission of BSOS-Economics department.

ECON603 Microeconomic Analysis I (3 Credits)
A detailed treatment of the theory of the consumer and of the firm, particularly emphasizing the duality approach. Topics include the household production model, imperfect competition, monopolistic and oligopolistic markets.
Restriction: Permission of BSOS-Economics department.

ECON604 Microeconomic Analysis II (3 Credits)
Analysis of markets and market equilibria; the Arrow-Debreu model of general equilibrium, the two-sector model, welfare theorems, externalities, public goods, markets with incomplete and asymmetric information.
Prerequisite: ECON603.
Restriction: Permission of BSOS-Economics department.

ECON611 Seminar in American Economic Development (3 Credits)
Selected topics in the long-term movements of the American economy. Quantitative studies of the growth of output; applications of econometric methods and economic theory to topics in American economic history.
Restriction: Permission of BSOS-Economics department.

ECON613 Origins and Development of Capitalism (3 Credits)
Institutions and technology shaping pre-capitalist economies: Archaic, Greek and Roman, Feudal, and Mercantile. Rise of the market system, national economies, and capitalism. The nature of industrial society. Imperialism.

ECON615 Development Economics I (3 Credits)
Explore both the causes and consequences in development economics from a historical and scientific approach. Presents theoretical models and applied work that test alternative hypotheses. Explore models of economic growth and institutions, with emphasis on property rights and political regimes as causal factors affecting development. Discuss empirical methods widely used in the field and important related topics including poverty, inequality, education and health.
Prerequisite: ECON603; or permission of BSOS-Economics department.

ECON616 Economic Development II (3 Credits)
Survey of a variety of models explaining how market failures may lead to poverty and underdevelopment, with an emphasis on the empirical evaluation of constraints faced by individuals in developing countries and the programs that attempt to alleviate those constraints. Topics include: agricultural and land markets, labor markets, human capital in developing countries, credit markets, and consumption smoothing and risk coping.
Prerequisite: ECON603, and ECON604; or permission of BSOS-Economics department.

ECON617 Topics in Development Economics (3 Credits)
Introduces students to the factors underlying contemporary trends in the economic development of low-income countries. Combining economic theory and empirical studies, students will learn about the unique challenges currently faced by policy makers in low-income settings, their economic determinants, and the evaluation of policy solutions. The course will center around a replication and extension exercise of a recent study in the development literature. A primary aim of the course is to prepare students to conduct independent research in development economics, with a particular focus on modern research methodology and applied econometrics.
Prerequisite: ECON603 and ECON604; or by permission of BSOS-Economics Department.
Restriction: Permission of BSOS-Economics Department.

ECON623 Econometrics I (3 Credits)
Topics covered include problems of specification, estimation, hypothesis testing, and prediction in linear models. Topics include: classical linear regression and ordinary least squares, generalized linear models and generalized least squares, identification and estimation of simultaneous equation models including discussion of two-stage and three-stage least squares and other instrumental variable estimation methods. Both finite and large sample analysis of econometric procedures will be covered, and there will also be discussion of general hypothesis testing principles including discussion of misspecification tests. In addition, the course will provide instructions on the use of a major statistical package such as Stata.
Prerequisite: Must have advanced knowledge of probability, statistics, and linear algebra.
Restriction: Permission of BSOS-Economics department.

ECON624 Econometrics II (3 Credits)
A continuation of ECON623. Topics include: Nonlinear models and nonlinear estimation methods (generalized method of moments and maximum likelihood estimation), panel data models, univariate dynamic models, multivariate dynamic models including simultaneous equation models, and non-parametric/semiparametric estimation methods. The course will also provide instructions on the use of a major statistical package such as Stata or TSP.
Prerequisite: ECON623; or permission of BSOS-Economics department.

ECON625 Computational Economics (3 Credits)
An examination of the specification, computation, estimation and interpretation of structural models that are widely used in Industrial Organization, and in a range of other applied microeconomic contexts (marketing and public, environmental, education and urban economics). The focus will be on the connections between these models and relevant economic theories, and on the details of their implementation in practice.
Prerequisite: ECON604 and ECON624.
Credit Only Granted for: ECON625 or ECON698R.
Formerly: ECON698R.

ECON626 Empirical Microeconomics (3 Credits)
An overview is provided of modern microeconometric methods with a focus on reduced form causal inference. Tools discussed include linear regression and selection on observables, instrumental variables including LATE and the role of heterogeneity in causal inference, difference-in-difference, regression discontinuity, synthetic control, matching, propensity score methods, and inverse probability weighted estimation. In addition, inferential issues such as weak instruments and techniques for robust standard errors, clustering, bootstrap and randomized inference are discussed, time permitting. The course places strong emphasis on relating statistical methods to substantive empirical applications. Each topic is introduced with an empirical paper that uses the technique. The discussion of technical material is at an intuitive level that focuses on applications and recommendations for empirical practice. The course offers an opportunity to work on a number of extended empirical exercises that are based on published papers and original data. Students practice working with data, implementing code in Stata and conducting their own empirical analysis. These exercises also offer practice in scientific writing relevant for empirical work.
Prerequisite: ECON624.
Restriction: Permission of BSOS-Economics Department.

ECON630 Computational Methods in Macroeconomics (3 Credits)
Essential computational methods used in macroeconomics. There will be particular focus on approximating the solution to dynamic stochastic general equilibrium models. Methods for representative-agent and heterogeneous-agent models will be extensively studied. Econometric methods such as Generalized Method of Moments, Maximum Likelihood, Vector Autoregressions wil also be covered.
Prerequisite: ECON602 and ECON601.
Restriction: Must be in one of the following programs (Economics (Master's); Economics (Doctoral)) ; or permission of BSOS-Economics department.

ECON635 Experimental Economics (3 Credits)
An introduction to the methodology of laboratory and field experiments. The course concentrates on a series of experiments to show how experiments build on one another, allowing researchers with different theoretical dispositions to narrow the range of potential disagreement.
Restriction: Permission of instructor.

ECON636 Behavioral Economics (3 Credits)
An exploration of how people make decisions, questioning the concept of "perfect rationality" in the standard economic theory, providing improved models in line with the observed biases of decision makers. Focusing on decision making under risk and ambiguity, endowment effect, status quo bias, loss aversion, intertemporal choice, and selfish and pro-social preferences.
Prerequisite: ECON603 and ECON604; and permission of BSOS-Economics department.

ECON637 Decision Theory (3 Credits)
Decision making is a process in which we select a course of action among available options. This course will explore the various behavioral biases observed in decision making processes by adjusting our normative theories to capture these biases.
Prerequisite: ECON603 and ECON604.
Restriction: Must be in the Economics program; or must have completed ECON603 and ECON604 with a letter grade of B+ or better.
Credit Only Granted for: ECON698B or ECON637.
Formerly: ECON698B.

ECON641 Microeconomic Analysis (3 Credits)
Microeconomic analysis applied to public policy problems with an emphasis on practical examples and how they illustrate microeconomic theories. Policy issues such as pollution, welfare and income distribution, market design, industry regulation, price controls, tax policy and health insurance are practical examples used to illustrate the abstract principles of microeconomics.
Restriction: Must be in M.Prof.Studies: Applied Economics program; or permission of BSOS-Economics department.
Credit Only Granted for: ECON641 or ECON506.
Formerly: ECON506.

ECON642 Topics in Applied Macroeconomics (3 Credits)
Focus is on applied macroeconomic models used by federal agencies to explain and predict economic behavior. Course emphasizes macroeconomic data: NIPA accounts, GDP, construction and application of CPI, labor force data and economic indicators. Students will also study a selected set of current macroeconomic topics including models of economic growth, economic fluctuations, monetary policy, inflation and financial markets.
Restriction: Must be in M.Prof.Studies: Applied Economics program; or permission of BSOS-Economics department.

ECON643 Empirical Analysis I: Foundations of Empirical Research (3 Credits)
Fundamental aspects of data management and interpretation emphasizing sampling, descriptive statistics, index numbers and construction of aggregated variables. Students will learn probability theory, confidence intervals, hypothesis testing and regression analysis using the EXCEL spreadsheet program and STATA statistical software.
Credit Only Granted for: ECON643 or ECON521.
Formerly: ECON521.

ECON644 Empirical Analysis II: Introduction to Economic Models (3 Credits)
An introduction to econometric methods with applications to public policy analysis. Primary focus on application and interpretation of multiple regression analysis.
Prerequisite: ECON643.

ECON645 Empirical Analysis III: Econometric Modeling and Forecasting (3 Credits)
Advanced techniques in applied econometrics, emphasizing the implementation of modern econometric methods to analyze concrete economic problems, including hands-on work using STATA software. Topics include advanced panel data methods, including instrumental variables, matching, difference-in-differences, regression discontinuity, sample selection corrections, limited dependent variable models,and an introduction to time series models.
Prerequisite: ECON644.
Restriction: Must be in MS Applied Economics program; or with permission from the program director.
Credit Only Granted for: ECON645 or ECON523.
Formerly: ECON523.

ECON652 Public Economics I (3 Credits)
The foundations of public economics, taxation, inequality, and behavioral public economics are reviewed. Major topics include welfare economics, tax incidence, behavioral responses to tax incentives and the efficiency cost of taxation, optimal taxation, income and wealth inequality, optimal tax systems and tax evasion, capital taxation and business income taxes, and taxation and behavioral economics. The course material is aimed to give students an understanding of both the foundations and methods of modern public economics, and important recent advances in our understanding of public economics. This is the first course in the two-part Ph.D. sequence in public economics.
Prerequisite: ECON604 and ECON624.

ECON662 Empirical Industrial Organization (3 Credits)
Dynamic models are important tools to understand intertemporal individual choices and industry evolution. The course discusses a number of issues estimating and solving dynamic models, complimenting and building on the methods and topics introduced in 625. The course also covers models of endogenous product choice, matching and market design. There will be two main sets of assignments, where students simulate data by solving models, estimate models based on simulated or real data and perform counterfactual analyses. The students will also be expected to submit a research proposal.
Prerequisite: ECON604 and ECON603.

ECON664 Empirical Studies in Industrial Organization (3 Credits)
Introduces students to the recent empirical literature of industrial organization. It consists of four themes: pricing and contracting; cartels, collusion and merger reviews; demand estimation; and information economics.
Prerequisite: ECON603, ECON604, and ECON624.
Credit Only Granted for: ECON664 or ECON698J.
Formerly: ECON698J.

ECON668 The Economics of Retail Systems (3 Credits)
This course is designed mainly but not exclusively for students in the third year of the economics Ph.D program and for students at a similar stage in a marketing program. Its main objective is to help the student generate their first professional research paper. In terms of interests it targets those in the area of microeconomics (advanced micro, industrial organization, or more generally applied microeconomics or micro aspects of any field). The course will be conducted as a seminar.
Repeatable to: 6 credits if content differs.

ECON670 Financial Economics (3 Credits)
The course applies microeconomic theory and applied econometric techniques to the study of financial institutions and markets for financial assets. Students will learn how economists model and estimate the value of financial assets. The economic and empirical models are of interest to public policy makers and private wealth managers. Specific topics can include financial intermediation, the regulation of financial institutions, risk management, portfolio theory, the capital asset pricing model and the efficient markets hypothesis.
Prerequisite: ECON641; and must have completed or be concurrently enrolled in ECON644.
Restriction: Must be in M.Prof.Studies: Applied Economics program.

ECON671 Economics of Health Care (3 Credits)
An examination of the structure, conduct and performance of the health care market, including a study of physician services, the pharmaceutical industry, the hospital market and health insurance. Students will analyze markets for health care and related products by examining the incentives and constraints for various participants, including individuals, family units, doctors, pharmaceutical companies, hospitals, and insurance providers. Extensive use of quantitative and analytic economic tools with special emphasis on regulatory responses to market imperfections.
Prerequisite: ECON641; and must have completed or be concurrently enrolled in ECON644.
Jointly offered with: ECON465.
Restriction: Must be in MS Applied Economics program; or with permission from the program director.
Credit Only Granted for: ECON671 or ECON465.

ECON672 Program Analysis and Evaluation (3 Credits)
Students study the tools used to evaluate the effectiveness of public policies. All evaluations have weaknesses, and some have more weaknesses than others. You will learn how to distinguish high from low quality evaluations. We will discuss the basic economics and econometrics of program evaluation, focusing on the application of methods used for causal inference and cost-benefit analyses in public policy contexts. We will examine published evaluation research with the intent of showing how the research does or does not lead to clear conclusions regarding program performance.
Prerequisite: ECON641 and ECON645.

ECON673 Information, Game Theory and Market Design (3 Credits)
Focuses on the interplay between information and incentives among multiple agents across a wide variety of settings. Students will learn how to analyze, critique, and optimize decision-making processes according to noncooperative game theory. Examples can include real-world market practices such as duopolies, auctions, contracts, negotiations, signaling/screening, market design etc.
Prerequisite: ECON641; and must have completed or be concurrently enrolled in ECON644.
Restriction: Must be in MS Applied Economics program; or with permission from the program director.

ECON674 Economic Analysis of Law (3 Credits)
Applies microeconomic theory to the analysis of legal rules and institutions. Topics include property rights, externalities, contract theory, bargain theory, remedies, industrial organization, patents, damages, and antitrust.
Prerequisite: ECON641; and must have completed or be concurrently enrolled in ECON644.
Restriction: Must be in MS Applied Economics program; or with permission from the program director.

ECON675 Environmental Economics (3 Credits)
Application of microeconomics and econometrics to analysis of environmental regulation. Many examples based on US policies, but the methods are broadly applicable in other contexts.
Prerequisite: ECON641; and must have completed or be concurrently enrolled in ECON644.

ECON676 Economic Development (3 Credits)
Analysis of economic development. The course will focus on the consequences of poverty and poor institutions for the behavior and welfare of individuals, households, firms and the aggregate economy in developing countries. Theoretical models and empirical evidence will be used to understand the intended and unintended consequences of policies designed to enhance economic development.
Prerequisite: ECON641; and ECON642; and must have completed or be concurrently enrolled in ECON644.
Restriction: Must be in M.Prof.Studies: Applied Economics program.

ECON677 International Trade and Applications (3 Credits)
A mix of theory and empirical work. Students will analyze the causes and consequences of international trade. The course will cover a set of conceptual tools that are useful for understanding "globalization" and the usage of these tools to address interesting and important questions about how countries, firms, and workers respond to international trade.
Prerequisite: ECON641 and ECON644.
Restriction: Must be in MS Applied Economics program; or with permission from the program director.

ECON683 International Macroeconomics and Finance (3 Credits)
Economic analysis of international macroeconomic issues and policy. Topics can include the study of exchange rates, balance of payments, international financial markets, international business cycles, contagion, and the roles played by international economic institutions.
Prerequisite: ECON641 and ECON642; and must have completed or be concurrently enrolled in ECON644.
Restriction: Must be in M.Prof.Studies: Applied Economics program.

ECON684 Applied Time Series Analysis and Forecasting (3 Credits)
This course builds on the brief introduction to time series econometrics offered in ECON 645. Students will learn the theory of stationary processes and how it applies to econometric techniques for estimation and forecasting based on time series data. The techniques will be applied in macroeconomic, financial and business applications.
Prerequisite: ECON642; and ECON645.
Restriction: Must be in M.Prof.Studies: Applied Economics program.

ECON685 Economic Applications of Machine Learning with Python (3 Credits)
Offers a comprehensive examination of the concepts and techniques used in machine learning using Python, with specific emphasis on their applications in economics. Students will explore linear and non-linear regression and classification methods, k-nearest neighbors, tree-based approaches, support vector machines, neural networks, regularization, and dimensionality reduction methods. The course also offers a wide range of assessments, model evaluation, and model selection methods.
Prerequisite: ECON641; and must have completed or be concurrently enrolled in ECON645.
Restriction: Must be enrolled in a version of the MS in Applied Economics Program (ECAM, ECAO, ECAE); or permission of the program director.

ECON687 Economics Applications of R Programming (3 Credits)
Builds on the data analysis and econometric skills learned in the Empirical analysis sequence of ECON 643, 644, and 645. The STATA skills acquired in that sequence, such as basic data manipulation and econometric estimation, will be extended to the R programming language. The fundamentals of more advanced scientific programming--objects, data structures, loops, functions, simulation, parallel computing--will be introduced with applications to economics and the social sciences. Additional emphasis is placed on good coding practices and tools for version control and collaboration such as Git and R Markdown.
Prerequisite: Must have completed or be concurrently enrolled in ECON645.
Restriction: Must be in Applied Economics Master of Science program; or permission of the program director.

ECON698 Selected Topics in Economics (3 Credits)

ECON699 Applied Economics Internship Experience (1-3 Credits)
Variable credit course for MS Applied Economics and Economic Analysis graduate certificate students participating in internships with well-established organizations and regular supervision from experienced professionals.
Restriction: Must be the Applied Economics Master's Program (ECAO or ECAM), or Economic Analysis Certificate Program (Z074 or Z098); and permission of program director.
Repeatable to: 6 credits.
Additional Information: Students may only earn credits during the term in which they are participating in the internship.

ECON701 Advanced Macroeconomics I (3 Credits)
Recent developments in macroeconomics with an emphasis on topics and techniques useful for conducting research in macroeconomics. Topics include advanced treatment of fiscal and monetary policy issues; the role of imperfect competition; real, sectoral and nominal business cycle models.
Prerequisite: ECON602 and ECON601.

ECON702 Advanced Macroeconomics II (3 Credits)
Recent advances in the fast-growing subfield of behavioral macroeconomics, with applications to business cycles and monetary economics. We will discuss surveys and controlled laboratory experiments that test the full information rational expectations (FIRE) hypothesis, and characterize deviations from FIRE in individual beliefs and actions, and we will study models that relax both the FI and the RE assumptions in general equilibrium settings, to bridge the gap between individual biases and constraints on the one hand and aggregate consequences and policy implications on the other.
Prerequisite: ECON602 and ECON601.

ECON703 Advanced Microeconomics I (3 Credits)
A formal treatment of game theory and its microeconomic applications is presented. Equilibrium concepts for static and dynamic games, and games with complete and incomplete information are studied. Topics also discussed: the relation between games in strategic form and games in extensive form, equilibrium refinement, Bayesian games, multi-dimensional mechanism design, dominant strategy and Bayesian implementation, Nash-in-Nash bargaining solutions.
Prerequisite: ECON604 and ECON603.

ECON704 Advanced Microeconomics II (3 Credits)
This is the second half of a two-semester sequence in Advanced Microeconomics, intended for second-year Ph.D. students. The course material varies from year-to-year, but currently it focuses on auction theory, matching theory, and the relationship between matching and auction theory. Other topics that are treated in some years include: sequential bargaining under incomplete information; and equilibrium refinements.
Prerequisite: ECON604 and ECON603.

ECON708 Advanced Topics in Applied and Theoretical Microeconomics (2 Credits)
Read, discuss, and analyze current topics in microeconomics, including public economics, environmental economics, labor economics, industrial economics, microeconomic theory, public choice and international trade. Specific topics covered will change from semester to semester depending on the students' and faculty's interests. Intended primarily for students beginning thesis research in economics.
Restriction: Permission of BSOS-Economics Department.
Repeatable to: 12 credits if content differs.

ECON709 Advanced Topics in Applied and Theoretical Macroeconomics (2 Credits)
Read, discuss, and analyze current topics in macroeconomics, including asset pricing models, models of economic growth, investment, and the labor market. Specific topics covered will change from semester to semester depending on the students' and faculty's interests. Intended primarily for students beginning thesis research in economics.
Restriction: Permission of BSOS-Economics Department.
Repeatable to: 12 credits if content differs.

ECON721 Econometrics III (3 Credits)
Oriented towards macro-econometric methods. Topics covered will be selected from the following: Further discussion of topics covered in ECON624, non-stationary time series models (models with deterministic trends, unit roots, co-integration, error correction models, vector autoregressive models), econometric models of conditional heteroskedasticity (ARCH and GARCH models), Bayesian econometrics and methods for Bayesian computation, large-dimensional factor analysis, models of changes in regime, and methods for time series forecasting.
Prerequisite: ECON624; or permission of BSOS-Economics department.

ECON722 Econometrics IV (3 Credits)
Orientated towards micro-econometric methods. Topics covered will be selected from the following: Further discussion of topics covered in ECON624, binary and multinomial response models, semiparametric and non-parametric estimation, machine learning algorithms, neural nets, and applications of ML to program evaluation and treatment effects methods. Introduces students to Python programming and Python ML toolkits Scikit and PyTorch. Structural econometrics, the identification problem, stratified and clustered samples, spatial and social network models, dynamic panel data models, weak instruments, non-parametric and semi-parametric estimation methods, boot strap and Jack Knife methods, pre-test estimators.
Prerequisite: ECON624; or permission of BSOS-Economics department.

ECON741 Advanced International Economics I (3 Credits)
International Business Cycles; Exchange Rate Determination; Imperfect Financial Markets; Deviations from Full Information Rational Expectations; Monetary and Exchange Rate Policy
Prerequisite: ECON601; or permission of BSOS-Economics department.

ECON742 Advanced International Economics II (3 Credits)
Comparative advantage, Heckscher-Ohlin theory, specific-factors model, empirical verification, economies of scale, imperfect competition, commercial policy, factor mobility.
Prerequisite: ECON603; or permission of BSOS-Economics department.

ECON743 Topics in International Finance (3 Credits)
Covers research in quantitative macroeconomics in international finance and with heterogeneous agents. The aim is to learn these models and how to solve them numerically to equip you with computational tools to apply in your own research on these topics.
Prerequisite: ECON630; or permission of BSOS-Economics department.

ECON744 Advanced Topics in International Economics (3 Credits)
Focuses on key topics in international macroeconomics. We will cover classic and recent papers on business cycles, exchange rates, capital flows, monetary and fiscal policy, sovereign debt, default, and currency denomination. The course will be orientated towards students initiating research in the field.
Prerequisite: ECON601 and ECON602.
Credit Only Granted for: ECON698M or ECON744.
Formerly: ECON698M.

ECON745 Advanced Topics in International Trade (3 Credits)
Designed primarily for students planning to write dissertations on a topic related to international trade. Its focus is on recent research in this field including tests of trade theories; the effects of trade on growth and knowledge diffusion; the political economy of trade policy and the theory and practice of trade agreements.
Prerequisite: ECON604 and ECON624.
Credit Only Granted for: ECON698L or ECON745.
Formerly: ECON698L.

ECON747 The Macreconomics of Imperfect Capital Markets (3 Credits)
A field course designed for students who have completed introductory graduate course work in macroeconomics. The course is built around three main ideas. First, its objective is to understand the role of financial markets for fluctuations in the macroeconomy. More specifically, starting from a complete markets benchmark, we study canonical types of credit market frictions that give rise to macroeconomic effects. Second, the course aims to enhance the students' toolkit to carry out state-of-the-art research in macroeconomics in general. It provides plenty of practical exercise to take models (usually DSGE models with financial frictions) to the computer. Third, alongside the methodological content, we revisit empirical facts on the regularities of financial variables, the 2008-09 global financial crisis and the Covid-19 recession.
Prerequisite: ECON601 and ECON602; or permission of BSOS-Economics department.

ECON752 Public Economics II (3 Credits)
Students will study a set of issues related to the government's role in the economy, focusing on government redistribution and social insurance. Major topics covered include the optimal design of government redistribution programs; theoretical and empirical analyses of major U.S. government transfer programs; the optimal design of social insurance programs; and theoretical and empirical analyses of major U.S. social insurance programs.
Prerequisite: ECON751.

ECON754 Theory of Political Economy (3 Credits)
Basic Electoral Models of Aggregating Preferences and Information. Political Participation and Voter Turnout. Pivotal and Ethical Voters. Opportunistic versus Policy-Motivated Candidates. Credibility of Policy. Political Agency and Accountability - Moral Hazard and Selection. Legislatures - Legislative Bargaining and Legislative Dynamics. Special Interest Politics. Campaign Financing. Political Polarization and Ambiguity. Behavioral Political Economy. Populism and Authoritarianism. Political Parties.
Prerequisite: ECON602 and ECON604; or permission of BSOS-Economics department.

ECON756 Empirical Political Economics (3 Credits)
An introduction to empirical political economy. Determinants of individual political behavior, the impact of political institutions on economic outcomes, and economic determinants of political institutions will all be analyzed. Modern applied econometric techniques will also be covered.

ECON771 Advanced Labor Economics: Theory and Evidence (3 Credits)
Provides students the theoretical background and econometric tools to engage and conduct research in labor economics. The course highlights the importance of a good balance between theory and solid empirical work. The topics include human capital, empirical earning functions, labor demand, incentive, discrimination, minimum wage, labor supply, tasks and skills, and inequality. In addition, it goes over essential topics in applied economics, including selection bias, instrumental variables, structural vs. reduced-form analysis, dynamic discrete choice models, and unobserved heterogeneity. During the term, students work with different data sets.
Prerequisite: ECON603 and ECON624; or permission of BSOS-Economics department.
Restriction: Must be in the Economics Doctoral program.

ECON772 Population Economics (3 Credits)
Explore topics in labor and public economics. Study the empirical evidence and the applied methodology used within labor and public economics. Discuss important topics in labor and public economics including immigration, education, discrimination, crime, and the role of family background. Provide instruction on how to perform empirical labor and public economic research by familiarizing students with available data sources, current research methodology, and practice with statistical packages such as Stata.
Prerequisite: ECON771; or permission of BSOS-Economics Department.

ECON773 Topics in Applied Public and Labor Economics (3 Credits)
Explore topics in labor and public economics. Study the empirical evidence and the applied methodology used within labor and public economics. Discuss important topics in labor and public economics including immigration, education, discrimination, crime, and the role of family background. Provide instruction on how to perform empirical labor and public economic research by familiarizing students with available data sources, current research methodology, and practice with statistical packages such as Stata.
Prerequisite: ECON603, ECON604, and ECON623; and (ECON624 or ECON626).

ECON781 Valuing Environmental Benefits (3 Credits)
The theory and practice of valuing environmental benefits, including the health, recreation and aesthetic benefits associated with controlling air and water pollution, and the damages associated with climate change. Estimation of the benefits of energy efficiency improvements-including the benefits of fuel economy standards.
Prerequisite: ECON603 and ECON623; or permission of BSOS-Economics department.

ECON785 Advanced Economics of Natural Resources (3 Credits)
The use of exhaustible and renewable natural resources from normative and positive points of view. Analysis of dynamic resource problems emphasizing energy, mineral, groundwater, forestry, and fishery resources; optimal, equilibrium, and intergenerational models of resource allocation.
Prerequisite: Permission of AGNR-Agricultural & Resource Economics department; or (ECON603 and AREC623).
Cross-listed with: AREC785.
Credit Only Granted for: AREC785 or ECON785.

ECON799 Master's Thesis Research (1-6 Credits)

ECON808 Workshop on Macroeconomics, International Macroeconomics and International Finance (2 Credits)
*
Restriction: Permission of BSOS-Economics department.
Repeatable to: 12 credits if content differs.

ECON818 Workshop in Microeconomic Theory (2 Credits)
Current research in microeconomic theory. Topics drawn from game theory, mathematical economics, and the economics of information and will include applications of the theory to diverse areas of economics. Specific topics: bargaining, auctions, mechanism design, signaling, general equilibrium, industrial organization theory, and financial markets theory.
Repeatable to: 12 credits if content differs.

ECON825 Advanced Economic Welfare Analysis (3 Credits)
Theory of economic welfare measurement, problems of path dependence in evaluating multiple price changes, welfare measurement under risk, general equilibrium welfare measurement with multiple distortions, and applications in evaluation of agricultural and resource policies.
Prerequisite: ECON604 and ECON603; or permission of BSOS-Economics department.
Credit Only Granted for: ECON825 or AREC825.

ECON828 Workshop in Econometrics (2 Credits)
Current research in econometrics. Topics drawn from theoretical and applied econometrics. Special topics include: maximum likelihood and generalized method of moments estimation of linear and non-linear models, analysis of stationary and non-stationary time series, cross section time series estimation, spatial estimation mehtods, Bayesian methods, semi-and non-parametic methods, rational expectations models, numerical methods, and various applications.
Repeatable to: 12 credits if content differs.

ECON848 Workshop in International Trade, Institutional Economics and Political Economy (2 Credits)
*
Restriction: Permission of BSOS-Economics department.
Repeatable to: 12 credits if content differs.

ECON858 Workshop in Public Economics (3 Credits)
Restriction: Permission of BSOS-Economics department.
Repeatable to: 6 credits if content differs.

ECON868 Workshop in Industrial Organization, Microeconomic Theory and Behavioral and Experimental Economics (2 Credits)
Workshops designed to provide a structured environment for our faculty and graduate students to meet regularly to discuss and present their research ideas.
Restriction: Permission of BSOS-Economics department.
Repeatable to: 12 credits if content differs.

ECON878 Workshop in Development, Labor and Public Economics (2 Credits)
*
Restriction: Permission of BSOS-Economics department.
Repeatable to: 12 credits if content differs.

ECON888 Workshop in Comparative Institutional Economics (2 Credits)
Current research in institutional economics and closely related fields such as economic transition, economic development, economic theory, law and economics, political economics, and economic history. Topics are drawn from both theoretical analysis of institutions and empirical studies of the effects and determinants of institutions.
Restriction: Permission of BSOS-Economics department.
Repeatable to: 12 credits if content differs.

ECON898 Pre-Candidacy Research (1-8 Credits)

ECON899 Doctoral Dissertation Research (1-8 Credits)

EDCI - Curriculum and Instruction

EDCI422 Student Teaching in Secondary Schools: Social Studies/ Geography (12 Credits)
Prerequisite: EDCI321.
Corequisite: EDCI420.

EDCI428 Field Experience in Secondary Social Studies Teaching (1 Credit)
Practical experience as an aide to a regular social studies teacher; assigned responsibilities and participation in a variety of teaching/ learning activities. Students must reserve one full day per week for internship placement.
Corequisite: EDCI427.
Restriction: Must be in Secondary Educ: Social Studies program; and minimum cumulative GPA of 2.75. Or permission of EDUC-Teaching, Learning, Policy and Leadership department.

EDCI438 Field Experience in Second Language Education (1 Credit)
Practical experience as an aide to a regular foreign language teacher; assigned responsibilities and participation in a variety of teaching/ learning activities.
Corequisite: EDCI330.
Restriction: Permission of EDUC-Teaching, Learning, Policy and Leadership department; and must be in Secondary Educ: Foreign Languages program.
Repeatable to: 3 credits if content differs.

EDCI448 Student Teaching in Secondary Schools: Theatre/English (12 Credits)
Practical experience as an aide to a regular English, speech or drama teacher; assigned responsibilities and participation in a variety of teaching/learning activities.
Prerequisite: EDCI417.
Corequisite: EDCI440.
Restriction: Must be in Secondary Educ: English Language Arts program.

EDCI497 The Study of Teaching (3 Credits)
Identification and examination of learner and teacher outcome variables related to teaching systems, methods, and processes. Methods of conducting classroom research.
Prerequisite: EDCI481.
Corequisite: EDCI489.

EDCI498 Special Problems in Teacher Education (1-6 Credits)
Individual study of approved problems.
Restriction: Must be in a major within EDUC-Teaching, Learning, Policy and Leadership department; or must be in Curriculum and Instruction (Doctoral) program; or must be in Curriculum and Instruction (Master's) program; or permission of EDUC-Teaching, Learning, Policy and Leadership department.
Repeatable to: 6 credits.

EDCI499 Workshops, Clinics, and Institutes (1-6 Credits)
The following types of educational enterprise may be scheduled under this course heading: workshops conducted by the College of Education (or developed cooperatively with other colleges and universities) and not otherwise covered in the present course listing; clinical experiences in pupil testing centers, reading clinics, speech therapy laboratories, and special education centers; institutes developed around specific topics or problems and intended for designated groups such as school superintendents, principals and supervisors.
Repeatable to: 6 credits.

EDCI618 Proseminar for Teaching Internship (1-3 Credits)
Supports and complements candidates' internship experiences. Extends skills in implementing less plans (lesson planning), culturally competent teaching, classroom management, issues of professionalism, and protfolio development.
Prerequisite: Admission to a masters certification program in EDCI.
Corequisite: Participation in an arranged school placement.
Formerly: EDCI688E.

EDCI619 Developing a Professional Portfolio (1-3 Credits)
Students will examine issues of performance assessment and develop professional portfolios following the guidelines established by the National Board for Professional Teaching Standards. Drawing on the research data collected throughout their program and relying on inquiry, reflections, and analysis, they will synthesize and present the body of their teaching experience.
Repeatable to: 3 credits.
Credit Only Granted for: EDCI614 or EDCI619.

EDCI694 Transformative Pedagogy and School Subjects (3 Credits)
Examines the potential of various pedagogoies to be transformative in relation to school subject matters, school identities, and school contexts.

EDCI788 Selected Topics in Teacher Education (1-3 Credits)
Current topics and issues in teacher education.
Repeatable to: 6 credits if content differs.

EDCI798 Special Problems in Teacher Education (1-6 Credits)
Intended for Masters, AGS, or doctoral students in education who desire to pursue a research problem.
Restriction: Permission of EDUC-Teaching, Learning, Policy and Leadership department.

EDCI799 Master's Thesis Research (1-6 Credits)

EDCI822 Seminar in Secondary Education (3 Credits)

EDCI888 Apprenticeship in Education (1-8 Credits)
Apprentice practice under professional supervision. Credit not to be granted for experience accrued prior to registration. Open only to degree- and certificate-seeking graduate students.
Restriction: Permission of EDUC-Teaching, Learning, Policy and Leadership department.

EDCI889 Internship in Education (3-8 Credits)
Internship experiences with appropriate supervision. Credit not to be granted for experience accrued prior to registration. Open only to students advanced to candidacy for doctoral degree.
Restriction: Permission of EDUC-Teaching, Learning, Policy and Leadership department.

EDCI898 Pre-Candidacy Research (1-8 Credits)

EDCI899 Doctoral Dissertation Research (1-8 Credits)

EDCP - Education Counseling and Personnel Services

EDCP411 Principles of Mental Health (3 Credits)
Mechanisms involved with personal adjustment, coping skills, and the behaviors that lead to maladjustment.
Prerequisite: 9 semester hours in the behavioral sciences; or permission of Counseling, Higher Education and Special Education department.

EDCP420 Advanced Topics in Human Diversity and Advocacy (3 Credits)
This course will build upon students' knowledge of diversity in American society and will examine contemporary topics related to multiculturalism in educational and community contexts as well as strategies for advocacy in such venues.

EDCP489 Field Experiences in Counseling and Personnel Services (1-4 Credits)
Planned field experience in education-related activities. Credit not to be granted for experiences accrued prior to registration.
Restriction: Permission of EDUC-Counseling, Higher Education and Special Education department.

EDCP498 Special Problems in Counseling and Personnel Services (1-3 Credits)
Available only to major students who have formal plans for individual study of approved problems.
Prerequisite: Available only to major students who have formal plans for individual study of approved problems.
Restriction: Permission of EDUC-Counseling, Higher Education and Special Education department.

EDCP499 Workshops, Clinics, Institutes (1-6 Credits)
The following type of educational enterprise may be scheduled under this course heading: workshops conducted by the Department of Counseling and Personnel Services (or developed cooperatively with other departments, colleges and universities) and not otherwise covered in the present course listing; clinical experiences in counseling and testing centers, reading clinics, speech therapy laboratories, and special education centers; institutes developed around specific topics or problems and intended for designated groups.
Repeatable to: 6 credits.

EDCP610 Professional Orientation (3 Credits)
Survey of knowledge base and practices in counseling and personnel services specializations, professional ethics, credentialling relevant legislation, current issues.

EDCP611 Career Development Theory and Programs (3 Credits)
Research and theory related to career and educational decisions; programs of related information and other activities in career decision.

EDCP612 Social and Cultural Theory (3 Credits)
An overview of key multicultural-social justice issues as they relate to the field of school counseling. This course examines social, cultural, historical, personal and emotional factors and their impact upon the counseling relationship from the aspects of both counselor, client and other systems impacting the counseling relationship.
Restriction: Permission of EDUC-Counseling, Higher Education and Special Education department.

EDCP614 Counseling Skills: Introduction to Practicum (3 Credits)
Development and utilization of counseling skills.
Corequisite: EDCP616.

EDCP615 Counseling I: Appraisal (3 Credits)
Collection and interpretation of appraisal data, synthesis of data through case study procedures. Development of interview skills.
Corequisite: EDCP618.
Restriction: Must be in a major within EDUC-Counseling, Higher Education and Special Education department.

EDCP616 Counseling II: Theory and Practice (3 Credits)
Counseling theories and the practices which stem from such theories.
Corequisite: EDCP614.

EDCP617 Group Counseling (3 Credits)
A survey of theory, research and practice of group counseling and psychotherapy, with an introduction to growth groups and the laboratory approach, therapeutic factors in groups, composition of therapeutic groups, problem clients, therapeutic techniques, research methods, theories, ethics and training of group counselors and therapists.
Prerequisite: EDCP616.

EDCP619 Practicum in Counseling (2-6 Credits)
Sequence of supervised counseling experiences of increasing complexity. Limited to eight applicants in advance. Two hours class plus laboratory.
Prerequisite: EDCP616.
Restriction: Permission of EDUC-Counseling, Higher Education and Special Education department.

EDCP620 Psychology and Diagnosis (3 Credits)
Understanding diagnosis and assessment of mental, addictive, and co-occurring mental/addictive disorders, using the diagnostic criteria of the most prevalent psychiatric disorders as specified by the American Psychiatric Association Diagnostic and Statistical Manuals.

EDCP621 Practicum in School Counseling (3-6 Credits)
Sequence of supervised counseling experiences of increasing complexity.
Prerequisite: EDCP616.
Restriction: Permission of EDUC-Counseling, Higher Education and Special Education department.
Credit Only Granted for: EDCP619D or EDCP621.
Formerly: EDCP619D.

EDCP622 Human Development in the Counseling Context (3 Credits)
An examination of the development of individuals over the lifespan. A focus on human development theories and the ways in which those theories are utilized within the counseling process to promote optimal development of individuals and families across the lifespan.
Credit Only Granted for: EDCP789X or EDCP622.
Formerly: EDCP789X.

EDCP624 Foundations of School Consultation and Collaboration I (3 Credits)
This course has the objective of equipping future generations to promote strengths, change, and prevention at multiple ecological levels in schools. The course focuses on the theoretical and empirical underpinnings of consultation which is conceptualized as a collaborative partnership with consultees. The practicum part of this course involves the opportunity to learn how to assess school culture in addition to the development of preliminary consultation skills via hands-on consultation experiences in a school as a novice consultant.
Restriction: Must be in the School Psychology doctoral program.
Credit Only Granted for: EDCP624 or EDCP635.

EDCP625 Overview of Alcohol and Drug Counseling (3 Credits)
An overview of basic concepts about the etiology, diagnosis and treatment of psychoactive substance use disorders (i.e., addictions), especially: causes and acceleration of national opioid epidemic; assessment, epidemiology, and neurobiology of addiction to major psychoactive drugs; treatments for addictions to psychoactive drugs; and national drug control and treatment policy.
Restriction: Must be in the School Counseling program; or permission of instructor.

EDCP630 School-Based Behavioral Interventions (3 Credits)
Behavior assessment and intervention techniques from behavioral, cognitive-behavioral, and ecological models. Planning, implementation, and evaluation of behavior change techniques.
Restriction: Permission of instructor; and must be in a major in EDUC-College of Education.

EDCP632 Cognitive Assessment (3 Credits)
Assessment of cognitive functioning of children and adolescents in reference to school learning and behavior problems. Administering, scoring and interpreting cognitive assessment instruments commonly used in school systems.
Restriction: Must be in the School Psychology program; or permission of EDUC-Counseling, Higher Education and Special Education department.

EDCP633 Diagnostic Appraisal of Children I (3 Credits)
Assessment of development, emotional and learning problems of children.
Prerequisite: EDCP632.

EDCP635 School Counselor Leadership: Consultation and Collaboration (3 Credits)
Designed to prepare students to lead programs and employ consultation and collaboration strategies in the development and implementation of data driven school counseling programs. Students will learn leadership and school-based consultation principles, theories, skills, and models necessary to address mental health, academic, and behavior issues in the school. Emphasis is placed on the role of the school counselor as a systemic change agent. Ultimately, the course will assist future school counselor leaders to build effective stakeholder collaboration and consultation teams that promote equitable services for all K-12 students.
Restriction: Must be in the School Counseling program; or must be in the School Psychology program; or permission of instructor.

EDCP636 School Consultation II (3 Credits)
Didactic practicum in consultation services in the school setting. Case consultation and organizational consultation in the schools. Practicum experience.
Prerequisite: EDCP635.
Restriction: Must be in the School Psychology program; or permission of instructor.

EDCP640 School Psychology Seminar: Overview of the Specialty (1-2 Credits)
Overviews the specialty of school psychology, including history of the specialty, roles and functions of school psychologists, and current professional issues related to the specialty.
Restriction: Must be in the School Psychology program; or permission of instructor.

EDCP641 School Psychology Seminar: Professional Ethics (1-2 Credits)
Overviews ethical issues in the specialty of school psychology.
Restriction: Must be in the School Psychology program; or permission of instructor.

EDCP651 Group Counseling in Schools (3 Credits)
Issues and techniques of group counseling in schools.
Prerequisite: EDCP616; and for school counseling and school psychology students only.
Restriction: Permission of instructor.

EDCP652 Research in Counseling (3 Credits)
An exploration of basic and applied research, program evaluation, and associated measurement and evaluation skills crucial for professional school counselors.
Restriction: Must be in the School Counseling program.
Credit Only Granted for: EDCP652 or EDCP789Y.
Formerly: EDCP789Y.

EDCP654 History of Psychological Science (3 Credits)
This course, intended for doctoral students in psychology, explores the historical development of psychological science and practice. Students will examine and discuss the original writings of persons involved in the making of psychology and of historians and others who have described and interpreted historical developments in psychology-as well as historical developments that influenced the making of psychology. The focus will be on understanding how the social, cultural, political and legal context of the times; developments in psychology and other sciences; technological advances; the evolution of the educational and scientific infrastructure; funding; and the growth in numbers of persons involved in psychological science and mental health have influenced psychology and been influenced by psychology. In other words, we will examine how psychological ideas about human nature, mental life, and behavior influence social and political events and arrangements as well as how social and political contexts influence psychological thinking and research.
Restriction: Permission of EDUC-Counseling, Higher Education and Special Education department.
Credit Only Granted for: EDCP654 or EDCP789F.
Formerly: EDCP789F.

EDCP665 Family and Social Support Systems (3 Credits)
Principles and methods useful for understanding the role of family support systems in counseling. Specialized skills for counseling impaired adults and their families.
Recommended: EDCP610.

EDCP668 Special Topics in Rehabilitation (1-6 Credits)
Restriction: Permission of EDUC-Counseling, Higher Education and Special Education department.
Repeatable to: 6 credits if content differs.

EDCP669 Professional Issues in Counseling Psychology (1 Credit)
Introduction to counseling psychology, including history and development of the field, and current professional and scientific issues. Exploration of career, research, and professional development opportunities.
Prerequisite: Must be in the Counseling Psychology program.
Cross-listed with: PSYC669.
Repeatable to: 3 credits if content differs.
Formerly: EDCP695.

EDCP672 Social & Cognitive Foundations of Counseling & School Psychology (3 Credits)
In depth examination of theoretical approaches and issues of social and cognitive psychology.
Restriction: Permission of EDUC-Counseling, Higher Education and Special Education department.
Credit Only Granted for: EDCP672 or EDCP789E.
Formerly: EDCP789E.

EDCP680 Basic Didactic Practicum in Counseling Psychology (3 Credits)
In depth examination of counseling theories and techniques, and supervised experience in application of a range of counseling and therapy approaches.
Prerequisite: For Counseling Psychology majors only.
Formerly: PSYC776.

EDCP682 Counseling Psychology Didactic Practicum in Group Interventions (3 Credits)
In depth examination of theories and techniques of group interventions; supervised experience in group counseling.
Prerequisite: For Counseling Psychology majors only.
Cross-listed with: PSYC682.
Formerly: EDCP718.

EDCP685 Counseling Psychology Didactic Practicum in Counseling Supervision (3 Credits)
In depth examinatin of theories and techniques of counseling supervision, supervised experience in the process of supervising counselors.
Cross-listed with: PSYC685.
Restriction: Must be in the Counseling Psychology program.
Formerly: EDCP745.

EDCP686 Counseling Psychology Didactic Practicum in Career Interventions (3 Credits)
In depth examination of theorectical approaches and issues in career interventions; supervised experience in career counseling and assessment.
Prerequisite: For Counseling Psychology majors only.
Formerly: EDCP777.

EDCP689 Seminar in Counseling Psychology (3 Credits)
Special topics in counseling psychology. Examples of topics include multicultural counseling, the counseling relationship, counseling and victimology, psychology treatment and health.
Prerequisite: For Counseling Psychology majors only.
Cross-listed with: PSYC689.
Repeatable to: 12 credits if content differs.
Formerly: EDCP789.

EDCP690 Research in Counseling Psychology I (3 Credits)
Critical analysis of strategies, methodological, conceptual, and content trends.
Prerequisite: For Counseling Psychology majors only.
Cross-listed with: PSYC690.
Formerly: EDCP778.

EDCP691 Research in Counseling Psychology II (3 Credits)
Critical analysis of trends and issues in counseling psychology science.
Prerequisite: For Counseling Psychology majors only. Cross-listed with PSYC691.
Formerly: EDCP717.

EDCP692 Assessment in Counseling Psychology I (3 Credits)
Broad introduction to the construction of psychological tests and measures, and experience in test interpretation, with consideration of historical, legal, ethical, and cultural issues surrounding the assessment process.
Prerequisite: For Counseling Psychology majors only. Cross-listed with PSYC692.
Formerly: EDCP789F.

EDCP693 Assessment in Counseling Psychology ii (3 Credits)
Supervised experience in administration, scoring, and interpreting major psychodiagnostic instruments used by counseling psychologists, as well as writing integrative assessment reports. Emphasis on hypothesis testing approach to assessment and on the counseling interview as an assessment tool.
Prerequisite: For Counseling Psychology majors only.
Formerly: EDCP789F.

EDCP694 Student Leadership Development (3 Credits)
Explores the development of leadership among college students including the study of leadership theory; a focus on how leadership is learned and developed; cultural dimensions of leadership; and exposure to the current national scene in leadership associations, programs, and resources.
Credit Only Granted for: EDCP694 or EDCP789D.
Formerly: EDCP789D.

EDCP695 Ethical and Professional Issues in Counseling Psychology (3 Credits)
Exploration of ethical and professional issues in Counseling Psychology.
Prerequisite: Must be in the Counseling Psychology program. Also offered as: PSYC695.
Credit Only Granted for: EDCP669, EDCP688, EDCP695, PSYC688, or PSYC695.
Formerly: EDCP669 and EDCP688.

EDCP697 Multicultural Issues in Counseling Psychology (3 Credits)
Exploration of knowledge, attitudes and skills for providing counseling and psychological services to culturally diverse populations.
Prerequisite: Only open to Counseling Psychology majors.
Credit Only Granted for: EDCP697, EDCP699, or PSYC697.
Formerly: EDCP699.

EDCP698 advanced Didactic Practicum in Counseling Psychology (3 Credits)
In depth examination of approaches to or theories abouth intervention, and supervised experience in the application of those approaches or theories. Each practicum focuses on a particular approach, e.g., psychodynamic, cognitive-behavioral, cross-cultural.
Prerequisite: For Counseling Psychology majors only.
Cross-listed with: PSYC698.
Repeatable to: 12 credits if content differs.
Formerly: EDCP776.

EDCP700 Theories and Strategies of Counseling Psychology (3 Credits)
Introduction to the professional field, examination of pertinent scientific and philosophical backgrounds, and survey of the major theories, principles, and training models in counseling. Correlated laboratory analogue experiences in dydactic and group interrelationships.
Prerequisite: For Counseling Psychology majors only.
Cross-listed with: PSYC700.
Formerly: EDCP789J.

EDCP701 Theories and Methods of Intervention (3 Credits)
An in-depth review of different theories and methods related to psychological interventions for children and adolescents.
Restriction: Must be in Counseling and Personnel Services (Doctoral) program; or permission of instructor.
Credit Only Granted for: EDCP789B or EDCP701.
Formerly: EDCP789B.

EDCP717 Evaluation of Research in Counseling (3 Credits)
Research on process and outcome in counseling. A review of research and appropriate research methodologies.
Restriction: Permission of EDUC-Counseling, Higher Education and Special Education department.

EDCP718 Advanced Seminar in Group Processes (2-6 Credits)
Prerequisite: Must have completed EDCP626.
Repeatable to: 6 credits.

EDCP738 Practicum in Child Assessment (1-6 Credits)
Administration of complete test batteries to children; supervision of initial interviews; test administration and scoring; interpretation and synthesis of test battery and interview material; the psychological report; verbal interpretation of test results; and recommendations. Taken initially with EDCP 633; repeated with EDCP 634 in the subsequent semester.
Corequisite: EDCP633 and EDCP634.
Restriction: Must be in the School Psychology program; or permission of instructor.
Repeatable to: 6 credits.

EDCP741 Multicultural Practice in Student Affairs: Self, Education, and Society (3 Credits)
Develop knowledge and skills in the area of multicultural practice in student affairs through the examination of oppression, power, and privilege and how these dynamics impact individuals, educational institutions, and societies.
Prerequisite: EDCP771.
Credit Only Granted for: EDCP741 or EDCP789Z.
Formerly: EDCP789Z.

EDCP742 Examining College Environments and Outcomes (3 Credits)
Explores theory and research on the impact of the college environment on undergraduate student outcomes. Discusses environmental theory and assessment, college impact theory, outcomes assessment, and implications of the above for higher education and student affairs.
Prerequisite: EDMS651; or permission of instructor.
Credit Only Granted for: EDCP742 or EDCP789K.
Formerly: EDCP789K.

EDCP743 Developmental Psychopathology (3 Credits)
Explore psychopathology from a developmental perspective and with an emphasis on affective bases of behavior
Restriction: Must be in Counseling and Personnel Services (Doctoral) program; or permission of instructor.
Credit Only Granted for: EDCP789Q or EDCP743.
Formerly: EDCP789Q.

EDCP746 Clinical Supervision of Pupil Personnel Services (3 Credits)
Supervision of role of psychologists and counselors in school settings; applied skills in supervision of services.
Prerequisite: Advanced Doctoral Students Only.
Restriction: Permission of instructor.

EDCP750 Therapeutic Approaches with Children (3 Credits)
Theoretical and empirical underpinnings of the therapeutic process with children.
Restriction: Must be in Counseling and Personnel Services (Doctoral) program; or permission of instructor.
Credit Only Granted for: EDCP789N or EDCP750.
Formerly: EDCP789N.

EDCP772 Research in Student Affairs (3 Credits)
Research designs and approaches to research in student development and higher education. Development of research for research competency or dissertation proposal.
Prerequisite: EDCP656; or permission of instructor.
Restriction: Must be in the College Student Personnel program.

EDCP774 Advanced Seminar in Theories of College Student Development (3 Credits)
An opportunity for in-depth study, dialogue, and reflection about theoretical frameworks for understanding the development of college students. Specific attention is given to enhancing knowledge and understanding of the development of students when social identities and their intersections are considered.
Prerequisite: EDCP771; or students who have taken courses with comparable content may contact the department.

EDCP775 Facilitating Student Learning in Higher Education (3 Credits)
Application of selected models of college student development, learning styles, and related models of instruction to the assessment of characteristics and the design of learning environments.
Prerequisite: EDCP771; or permission of EDUC-Counseling, Higher Education and Special Education department.
Restriction: Must be in Counseling and Personnel Services (Doctoral) program.

EDCP776 Social Justice in Student Affairs and Higher Education (3 Credits)
An exploration of differences, biases, assumptions, limitations, and challenge with diversity in the context of higher education and student affairs. Focusing on issues of inequities with social identity group membership and the systems of power, privilege, and oppression in society.
Prerequisite: EDCP771 or EDCP741; or permission of instructor.
Restriction: Limited to college student personnel students only.

EDCP778 Research Proposal Seminar (3 Credits)
The development of thesis, dissertation or other research proposals.

EDCP788 Advanced Practicum (1-6 Credits)
Individual supervision in one of the following areas: (a) individual counseling, (b) group counseling, (c) consultation, or (d) administration.
Prerequisite: Previous practicum experience.
Restriction: Permission of EDUC-Counseling, Higher Education and Special Education department.

EDCP789 Advanced Topics in Counseling and Personnel Services (1-6 Credits)
Repeatable to: 6 credits.

EDCP797 Capstone Course: Program Planning (3-6 Credits)
Restriction: Must be in the School Counseling program.
Credit Only Granted for: EDCP789T or EDCP797.
Formerly: EDCP789T.

EDCP798 Special Problems in Counseling and Personnel Services (1-6 Credits)
Master's AGS, or doctoral candidates who desire to pursue special research problems under the direction of their advisers may register for credit under this number.
Prerequisite: Master's AGS, or doctoral candidates who desire to pursue special research problems under the direction of their advisers may register for credit under this number.

EDCP799 Master's Thesis Research (1-6 Credits)
Registration required to the extent of six hours for Master's thesis.

EDCP870 Professional Issues Seminar (3 Credits)
Examination of issues that bear on professional issues such as ethics, inter-professional relationships and research.
Credit Only Granted for: EDCP656 or EDCP870.
Formerly: EDCP656.

EDCP871 Student Affairs Doctoral Capstone Seminar (3 Credits)
Broadening perspectives on issues in student affairs and higher education by exploring the multiple roles and responsibilities of campus administrators and faculty members.
Prerequisite: EDCP870; or permission of instructor.
Restriction: Must be in the College Student Personnel program.
Credit Only Granted for: EDCP789I or EDCP871.
Formerly: EDCP789I.

EDCP879 Internship in School Counseling (4-8 Credits)
Apprentice practice under professional supervision in an area of competence compatible with the student's professional goals. Credit not to be granted for experience accrued prior to registration. Open only to degree- and certificate-seeking graduate students.
Restriction: Permission of EDUC-Counseling, Higher Education and Special Education department.
Repeatable to: 9 credits.
Credit Only Granted for: EDCP888G or EDCP879.
Formerly: EDCP888G.

EDCP888 Apprenticeship in Counseling and Personnel Services (1-8 Credits)
Apprentice practice under professional supervision in an area of competence compatible with the student's professional goals. Credit not to be granted for experience accrued prior to registration. Open only to degree- and certificate-seeking graduate students.
Restriction: Permission of EDUC-Counseling, Higher Education and Special Education department.

EDCP889 Internship in Counseling and Personnel Services (1-8 Credits)
Internship experiences at a professional level of competence in a particular role with appropriate supervision. Credit not to be granted for experience accrued prior to registration. Open only to students advanced to candidacy for doctoral degree.
Prerequisite: Open only to students advanced to candidacy for doctoral degree.
Restriction: Permission of EDUC-Counseling, Higher Education and Special Education department.
Repeatable to: 8 credits if content differs.

EDCP898 Pre-Candidacy Research (1-8 Credits)

EDCP899 Doctoral Dissertation Research (1-8 Credits)
Registration required to the extent of 12-18 hours for a Ph.D. Dissertation.

EDHD - Education, Human Development

EDHD400 Introduction to Gerontology (3 Credits)
Multidisciplinary survey of the processes of aging. Physiological changes, cultural forces, and self-processes that bear on quality of life in later years. Field study of programs, institutions for elderly, individual elders, their families and care providers.

EDHD402 Social Development (3 Credits)
Social Development. Critical concepts and ideas of the study of child and adolescent social development. Focus on changes in interpersonal relationships, emotions, achievement-related behavior and competence, and functioning within the broader social context.
Recommended: EDHD411.

EDHD405 Information Weaponization: Thinking Critically in a Changing World (3 Credits)
Contemporary challenges--such as climate change, food, energy and water security, and deadly virus transmission--demand that people think critically. While many societal challenges are seriously impacting local, regional and global communities, an increasing availability of information has contributed to what many call a "Post-Truth Era." We will consider the institutional use of post-truth a form of information weaponization. This course asks how information weaponization impacts the evaluation of valid lines of evidence and explanations. How do we evaluate and what is needed to improve individuals' evaluations of claims? This course will focus on mythological and unproductive thinking, increased digital literacy, enhanced reasoning, evaluation skills, and critical thinking.
Credit Only Granted for: HNUH238Y or EDHD405.
Formerly: HNUH238Y.

EDHD411 Child Growth and Development (3 Credits)
Theoretical approaches to and empirical studies of physical, psychological and social development from conception to puberty. Implications for home, school and community.

EDHD412 Infant Development (3 Credits)
Infant development across domains, including perceptual, motor, cognitive, language, social and emotional functioning from pre-natal through third year of life.

EDHD413 Adolescent Development (3 Credits)
Adolescent development, including special problems encountered in contemporary culture. Observational component and individual case study.

EDHD414 Development of the Scientific Mind Across the Lifespan (3 Credits)
Study of the educational, cognitive, social, and cultural factors that underlie the development of the scientific mind across the lifespan.
Recommended: EDHD320.

EDHD415 Promoting the Social-Emotional Competence of Young Children in Inclusive Classrooms (3 Credits)
Teachers must have knowledge and skill regarding how to appropriately manage the classroom so that all children, those with and without disabilities, will be able to learn from their school experiences. Classroom management extends beyond responding to student misbehavior to include a comprehensive approach to addressing the social/emotional competence of typically and atypically developing children. The goal of this course is to prepare early childhood teachers who are able to sensitively, responsively, and effectively manage a classroom of young students who are typically developing and those who have disabilities. Includes Field Experience.
Prerequisite: EDHD314 and EDHD425; and (EDHD419 or EDSP420).
Corequisite: EDSP423, EDSP424, and EDHD431.
Restriction: Must be in the Professional Early Childhood/Early Childhood Special Education program; and junior standing or higher; and minimum cumulative GPA of 2.75.

EDHD420 Cognitive Development and Learning (3 Credits)
Current developmental theories of cognitive processes such as language, memory, and intelligence and how differences in cognitive level (infancy through adolescence) mediate learning of educational subject matters.
Prerequisite: EDHD320, EDHD411, PSYC341, or PSYC355; or permission of EDUC-Human Development and Quantitative Methodology department.

EDHD421 Developmental Perspectives on Peer Interactions, Relationships, and Groups (3 Credits)
Explores the historical and theoretical foundations of contemporary research on peer interactions, relationships, and groups. It examines the interplay between individual characteristics, social behaviors, and relationships, and familial and extra-familial factors with an emphasis on diversity in the peer experience across various cultural, ethnic, gender, ability, and socioeconomic contexts.
Recommended: EDHD411 and EDHD306.

EDHD424 Culture, School & Community: Contexts for Learning (PreK-3rd) (3 Credits)
Explores the development of the young child (with and without disabilities, as well as those at environmental risk) in the context of the family and community, with emphasis on the impact of state, federal and school system policy on the child's world. Course will consider issues within the family, and the wider socio-cultural ecology that relate to the child's ability to develop and learn. In addition, students will develop strategies for respectful and culturally responses approaches to actively engage families in their children's development and learning. Includes Field Experience.
Prerequisite: EDHD425 and EDHD314; and (EDHD419 or EDSP420).
Corequisite: EDSP315, EDHD431, EDHD415, and EDSP423.
Restriction: Must be in the Professional Early Childhood/Early Childhood Special Education program; and junior standing or higher; and minimum cumulative GPA of 2.75.

EDHD425 Language Development and Reading Acquisition (3 Credits)
This course focuses on young children's language development and the relationship between language and reading acquisition. Students will learn: concepts central to language development; language achievements at different ages; concepts of emergent literacy; models of reading acquisition and skilled reading.

EDHD426 Cognitive and Motivational Literacy Content (3 Credits)
Students preparing for secondary teaching will learn about the cognitive and motivational aspects of literacy and learning from text for the content areas of literature, science, history and mathematics. Different evidenced-based literacy approaches appropriate for content learning are presented. Characteristics of learning environments that enable students to engage productively with diverse texts, disciplinary tasks, and technological resources in content areas are identified.

EDHD431 Child Development and Learning, Three to Eight Years (3 Credits)
Provides a basic understanding of child development theory and research, as well as specific knowledge about the development of children during the early and middle childhood "stages," specifically from ages 3 years to 8 years. A major emphasis will be the application of theory and research from the field of educational psychology to an understanding of how young children learn and achieve academically. Because the course will address the developmental and academic functioning of children with and without disabilities, a particular focus will be on individualization.
Prerequisite: Minimum grade of C- in EDHD314 and EDHD425; and 1 course with a minimum grade of C- from (EDHD419, EDSP420).
Corequisite: EDSP423 and EDSP315; and TRACK I: Must be concurrently enrolled in EDSP430, EDSP433; or TRACK 2: Must be concurrently enrolled in EDHD415, EDHD424.

EDHD432 Internship in EC/ECSE (12 Credits)
Interns spend five days per week in the classroom/home-based setting (under the mentorship of a certified teacher) where they gradually assume full responsibility for the planning, delivery and assessment of instruction or an intervention. Track I students will have an Infant/Toddler placement with special educator, Track II students will be in a Pre-K/K or Grade 1,2,3 classroom with general or special educator (must be opposite grade level and mentor from Phase I/fall of the senior year).
Prerequisite: EDHD323, EDHD322, EDSP417, EDHD441, EDHD442, EDHD443, EDHD444, and EDSP321.
Corequisite: EDHD437.
Restriction: Must be in Early Childhood and Early Childhood Special Education program; and senior standing or higher.

EDHD434 Child Development, Birth to Three Years (3 Credits)
Designed to provide students with an understanding of child development theory and research, as well as knowledge about typical and atypical development of children from birth to three years of age. The course emphasizes learning for children with and without disabilities, and for children who are at risk due to poverty and other environmental factors. The course will introduce how children develop and the challenges they face within the domains of physical, cognitive, language, social, and emotional development, with particular attention paid to the impact of risk factors on development. Students will become familiar with delays and differences in development that may occur as the result of disability. Finally, students will learn the effects of cultural and linguistic differences on growth and development. Information about theory and research in child development for children with and without disabilities will be enhanced through a series of observational experiences, which will build upon concepts addressed during class. Includes field experiences.
Prerequisite: EDHD210, EDHD220, and EDSP211.
Corequisite: EDHD314 and EDHD425.
Cross-listed with: EDSP420.
Credit Only Granted for: EDHD419A, EDSP420 or EDHD434.
Formerly: EDHD419A.

EDHD436 Cognition and Motivation in Content Area Literacy for Middle-School Students (3 Credits)
Cognitive and motivational processes of literacy and learning from texts across subjects. Structured approaches to using reading, writing, and speaking for content learning based on approaches to knowledge, motivation, and strategies. Classroom contexts that enable middle-school students to engage with diverse texts and Internet resources are provided

EDHD437 EC/ECSE Teachers as Researchers and Reflective Practitioners (3 Credits)
Students use action research to improve instructional delivery or familial interactions in an effort to enhance the overall educational experiences/outcomes of children in classrooms or home-based contexts. Students will design and implement an action research project in an effort to meet a goal articulated in an applicable Individualized Education Plan (IEP) or Individualized Family Service Plan (IFSP) or School Improvement Plan (SIP) as the basis of their project.
Prerequisite: Minimum grade of C- in EDHD322, EDHD323, EDSP321, EDSP417, EDHD441, EDHD442, EDHD443, and EDHD444.
Corequisite: EDHD432.

EDHD440 Adult Development (3 Credits)
Major conceptual approaches to the study of adult development including physical, cognitive, social, emotional and self processes that take place within individuals as they progress from emerging adulthood through middle age.
Prerequisite: EDHD320; or permission of EDUC-Human Development and Quantitative Methodology department.
Recommended: EDHD413.

EDHD441 Data Driven Decision Making in EC/ECSE (1 Credit)
Students will be exposed to formative (e.g., classroom based, ongoing) and summative (e.g., standardized testing) assessments. Students will collect and analyze formative assessment data from their internship classrooms as the bases of planning and delivering instruction to meet the diverse needs of all learners. They will also analyze standardized assessment data to gain an understanding of measures used to determined cross-school and cross-teacher effectiveness. Includes Phase I field experience.
Prerequisite: Minimum grade of C- in EDSP423, EDHD431, and EDSP315; and TRACK I: Must have completed EDSP430 and EDSP433 or TRACK 2: Must have completed EDHD415 and EDHD424.
Corequisite: EDHD322, EDHD323, EDSP321, EDSP417, EDHD442, EDHD443, and EDHD444.

EDHD442 Interventions for Children with Behavioral Challenges (1 Credit)
Students will expand knowledge of and develop skills to address challenging behaviors in inclusive early childhood classrooms. Students examine the causes underlying challenging behaviors during the early childhood years, and identify appropriate resources and support services for working with families to develop a unified approach when responding to behavioral challenges. Includes Phase I field experience.
Prerequisite: Minimum grade of C- in EDSP423, EDHD431, and EDSP315; and TRACK I: Must have completed EDSP430 and EDSP 433; or TRACK 2: Must have completed EDHD415 and EDHD 424.
Corequisite: EDSP321, EDSP417, EDHD322, EDHD323, EDHD441, EDHD443, and EDHD444.

EDHD443 Interventions for Children with Social and Communication Challenges (1 Credit)
Students will learn about the characteristics of children with autism spectrum disorder, pervasive developmental disorder, social communication disorder, and other related challenges and will be equipped to meet the needs of this group of children in the early childhood classroom. The utilization of Universal Design for Learning (UDL), Response to Intervention (RTI) and other early childhood special education approaches, as they apply to this specific group of children, will be addressed. Interventions designed to improve the functioning of children with autism spectrum disorders and related disorders will be reviewed. Includes Phase I field experience.
Prerequisite: Minimum grade of C- in EDSP423, EDHD431, and EDSP315; and TRACK I: Must have completed EDSP430 and EDSP 433; or TRACK 2: Must have completed EDHD415 and EDHD 424.
Corequisite: EDHD322, EDSP321, EDSP417, EDHD323, EDHD441, EDHD442, and EDHD444.

EDHD444 Action Research in EC/ECSE (1 Credit)
Students will become familiar with the EC/ECSE research process, literature and how teachers use action research to improve pedagogy and the experiences of children in classrooms or home-based contexts. Students will utilize this knowledge, as well as either a goal in an Individualized Education Plan (IEP) or Individualized Family Service Plan (IFSP) or School Improvement Plan (SIP), to develop an action research study commenced during the following semester. Includes Phase I field experience.
Prerequisite: Minimum grade of C- in EDSP423, EDHD431, and EDSP315; and track 1: Must have completed EDSP430 and EDSP433; OR Track 2: Must have completed EDHD415 and EDHD424.
Corequisite: EDHD322, EDHD323, EDHD441, EDHD442, EDHD443, EDSP417, and EDSP321.

EDHD460 Educational Psychology (3 Credits)
Application of psychology to learning processes and theories. Individual differences, measurement, motivation, emotions, intelligence, attitudes, problem solving, thinking and communicating in educational settings.
Prerequisite: PSYC100; or permission of EDUC-Human Development and Quantitative Methodology department.

EDHD474 Human Development Honors Seminar (3 Credits)
This seminar will have three overarching goals: (1) expose students to fundamental research questions in human development; (2) create professional development opportunities through invited speakers and (3) communicate an understanding of diversity, equity, and inclusion in all aspects of the research process.
Restriction: Must be in the Human Development Honors program.

EDHD475 Human Development Honors Thesis Preparation Course (3 Credits)
This is an individual instruction course with the thesis faculty advisor. In this course, students will work towards writing and completing their honors thesis, which will include a review of relevant literature, the rationale for the research project, research questions, methods for data collection, analysis plan, results, and a discussion of the findings. Faculty advisors will communicate the goals of the major surrounding issues of diversity, equity, and inclusion.
Prerequisite: EDHD474.
Restriction: Must be in the Human Development Honors program.

EDHD476 Human Development Honors Thesis Research (3 Credits)
This is an individual instruction course with the thesis advisor, culminating in the presentation and defense of the student's thesis. Students will address the aspects of their research that reflect diversity, equity, and inclusion.
Prerequisite: EDHD475.
Restriction: Must be in the Human Development Honors program.

EDHD488 Special Topics in Human Development (3 Credits)
Special and intensive treatment of current topics and issues in human development.
Prerequisite: EDHD320.
Recommended: PSYC100.
Restriction: Permission of EDUC-Human Development and Quantitative Methodology department.
Repeatable to: 6 credits if content differs.

EDHD489 Field Experiences in Human Development (3-6 Credits)
Planned field experience (internship or research-based activities) related to Human Development. Credit not to be granted for experiences accrued prior to registration.
Restriction: Permission of EDUC-Human Development and Quantitative Methodology department.
Repeatable to: 6 credits.

EDHD498 Special Research Problems in Human Development (1-4 Credits)
Exploration of current research problems in the study of human development. Available only to students who have definite plans for individual study of approved research problems. Credit according to extent of work.
Restriction: Permission of EDUC-Human Development and Quantitative Methodology department.
Repeatable to: 6 credits.

EDHD499 Workshops, Clinics, and Institutes (1-6 Credits)
The following types of educational enterprise may be scheduled under this course heading: workshops conducted by the College of Education (or developed cooperatively with other colleges and universities) and not otherwise covered in the present course listing; clinical experiences in pupil-testing centers, reading clinics, speech therapy laboratories, and special education centers; institutes developed around specific topics or problems and intended for designated groups such as school superintendents, principals and supervisors.
Repeatable to: 6 credits.

EDHD600 Introduction to Human Development and Child Study (3 Credits)
An overview of the multidisciplinary, scientific principles which describe human development and behavior and an application of these principles in an analysis of a behavioral record. Techniques of observation, recording, and analysis of human behavior. Emphasis on critiquing and applying research findings.

EDHD602 Social Bases of Behavior (3 Credits)
The social forces and expectations that influence behavior from infancy through old age and death. The effects of ethnicity, social learning values, attitudes, historical events and mass media on perception and behavior in societal interactions.

EDHD611 Cultural and Contextual Influences on the Young Child (3 Credits)
Theory and research on social and cultural influences in early child development.

EDHD617 Achievement Motivation in Adolescence (3 Credits)
Study of different aspects of motivation and how they develop in the secondary school years. Focus on how different instructional practices influence motivation and design of various strategies for improving students motivation.
Credit Only Granted for: EDHD779W or EDHD617.
Formerly: EDHD779W.

EDHD619 Advanced Scientific Concepts in Human Development (3 Credits)
A critical examination of concepts and issues in contemporary culture as these relate to the development and learning of children and youth.
Repeatable to: 6 credits if content differs.

EDHD629 Developmental Science Seminar and Colloquium (1 Credit)
A seminar and colloquium series featuring speakers from the department, the college, the university, and other universities and institutions from across the world that aims to cover issues pertaining to contemporary theory and research in human development, child development, and developmental science. The seminar format is a weekly colloquia series, along with discussion sessions related to a range of developmental science topics.
Recommended: For graduate students in the Human Development program.
Repeatable to: 8 credits if content differs.

EDHD635 Adolescents at Risk (3 Credits)
Study of current research on risky behaviors that impact adolescent student learning and achievement particular in underserved populations. General diversity issues and topics specific issues that put adolescents at risk for academic failure and other negative trajectories will be explored.
Recommended: EDHD600.
Credit Only Granted for: EDHD635 or EDHD779L.
Formerly: EDHD779L.

EDHD659 Direct Study of Individuals (3 Credits)
Observational techniques to record the behavior of an individual. Procedures to ensure objectivity in data collection. Methods used to analyze, categorize, quantify observational data in research.

EDHD662 Research Methods in Education Settings (3 Credits)
Research methods associated with studying the development, achievement, and school adjustment of children and adolescents in educational settings, with an emphasis on quantitative methodologies.

EDHD674 Self Processes in Adolescence: Implications for Academic Achievement and School Adjustment (3 Credits)
Study of the development of the self from infancy through adolescence, and examination of the literature on the self processes of special adolescent populations as they relate to achievement-related orientations and school adjustment in secondary settings.
Credit Only Granted for: EDHD619L or EDHD674.
Formerly: EDHD619L.

EDHD690 Theoretical Foundations of Human Development (3 Credits)
Theoretical foundations in the field of human development with a focus on connections between the major theoretical paradigms in the literature and current research in developmental science.

EDHD692 Cognitive Basis of Instruction (3 Credits)
Psychological and educational research literature on human cognition, especially as applied to learning and teaching in classroom settings.
Restriction: Permission of EDUC-Human Development and Quantitative Methodology department.

EDHD703 Source Selection, Multimedia, & Misinformation: How Students Learn to Navigate Evidence in the 21st Century (3 Credits)
Explores how students come to understand how evidence is acquired, produced, and used to make inferences and draw conclusions about the world. Topics will include selective trust, source selection, navigating multiple mediums and modalities, epistemic cognition, scientific reasoning, motivated cognition, and confirmation bias. We will explore both basic research on these topics as well as ways in which this research can be used to foster critical thinking and scientific literacy in childhood and beyond, in both formal and informal educational settings.

EDHD711 Peer-Culture and Group Processes in Human Development (3 Credits)
The process of group formation, role-taking and status-winning, and the emergence of the peer-culture during childhood and the evolution of the child society at different maturity levels to adulthood. The developmental tasks and adjustment problems associated with winning, belonging, and playing roles in the peer group.
Prerequisite: Permission of EDUC-Human Development and Quantitative Methodology department.

EDHD718 Apprenticeship in College Teaching (1 Credit)
For graduate students teaching autonomously for the first, second, or third tiem at the University of Maryland, College Park; not intended for teaching assistants. This course provides graduate student teachers with a set of structured experiences that foster professional growth and development in the role of college instructor. Includes seminars on the scholarship of college teaching and principles of optimal college classroom environments, peer and faculty in-class observations of teaching, and guided reflective analysis of experience in the classroom.
Restriction: Permission of EDUC-Human Development and Quantitative Methodology department.

EDHD720 Social Development and Socialization Processes (3 Credits)
This course covers social development and socialization processes across the life-span. The course typically covers the following topics: parent-child relationships, peer relationships, moral development, social cognition, social competence, social motivation, self-regulation, and cultural influences on development. This is core doctoral course.

EDHD721 Cognitive Development and Learning: An Introduction (3 Credits)
Introductory survey into contemporary theory and research in cognitive development; applications to classroom learning.

EDHD722 Learning Theory and the Educative Process (3 Credits)
Advanced study of theories, issues and research in several categories of cognition and learning applied to education and the helping professions.
Prerequisite: EDHD721; or permission of EDUC-Human Development and Quantitative Methodology department.

EDHD750 Culture, Context, and Development (3 Credits)
This course will cover theory and research on cultural and contextual influences on social development.

EDHD751 Child Development and Poverty (3 Credits)
This course examines the theoretical, methodological, and empirical literature on the effects of poverty on children's development from a multidisciplinary perspective. It includes basic concepts in methodology, measurement design, and issues related to connecting basic research on poverty and children to policy and program interventions.
Prerequisite: EDHD720; or permission of EDUC-Human Development and Quantitative Methodology department.

EDHD760 Advanced Educational Psychology (3 Credits)
Appplication of psychology to learning processes and theories. Individual differences, measurement, motivation, and intelligence.
Prerequisite: Prior course in educational psychology, learning, or cognition; or permission of EDUC-Human Development and Quantitative Methodology department.

EDHD768 Laboratory Methods in Developmental Psychophysiology (3 Credits)
Covers basic electrophysiology and human electrophysiology. Topics include recording, processing, and analyzing EEG and ERP. Emphasis will be placed on the testing of infant and child populations.
Recommended: EDHD775.
Restriction: Permission of instructor.
Repeatable to: 6 credits if content differs.

EDHD775 Human Development and Neuroscience (3 Credits)
Course focuses on the biological bases of human behavior including physiological processes which have an impact on human development.
Prerequisite: EDHD601; or permission of EDUC-Human Development and Quantitative Methodology department.

EDHD779 Selected Topics in Human Development (1-6 Credits)
This course focuses on topics of current significance in human development research. Topics covered change each semester, and vary by instructor.
Restriction: Permission of EDUC-Human Development and Quantitative Methodology department.
Repeatable to: 6 credits if content differs.

EDHD780 Research Methods in Human Development (3 Credits)
Research methodology for studying human development: research design, hypothesis formulation, instrument development, methodological and statistical approaches, survey of methodologies.
Prerequisite: EDMS651; or permission of EDUC-Human Development and Quantitative Methodology department.

EDHD789 Internship in Human Development (3-8 Credits)
Internship experience in one or more human service agencies in the community.
Prerequisite: 9 credits in EDHD courses.
Restriction: Permission of EDUC-Human Development and Quantitative Methodology department.
Repeatable to: 9 credits.

EDHD798 Laboratory in Human Development (1-6 Credits)
Independent research supervised by an instructor in a research setting.
Repeatable to: 9 credits if content differs.

EDHD799 Master's Thesis Research (1-6 Credits)
Registration required to the extent of six hours for master's thesis.

EDHD800 Seminar in Early Childhood Education (3 Credits)
This seminar explores relevant current issues in early childhood development and education.

EDHD835 The Development of Achievement Motivation (3 Credits)
Development of achievement motivation and how it relates to academic achievement during the elementary and secondary school years. Expectancy-value theory, attribution theory, self-efficacy theory, socialization of achievement motivation.
Prerequisite: EDHD830 or EDHD721; or permission of EDUC-Human Development and Quantitative Methodology department.

EDHD840 Language and Literacy Development (3 Credits)
Content of this course is current theoretical and empirical research on children's language developments and on the linguistic basis of beginning reading.

EDHD850 Social Cognition and Moral Reasoning (3 Credits)
Theory and research on social-cognition development and moral development, from infancy to adolescence will be covered.

EDHD872 Young Children at Environmental Risk: Developmental and Intervention Issues (3 Credits)
Examination of impact of poverty on young children, their families, and communities. Epidemiological, physiological, and sociological studies will be reviewed.

EDHD878 Applied Research and Strategies (3 Credits)
Examine current human development research literature, define a research problem and design and implement a research study or review in collaboration with faculty.
Prerequisite: EDMS651; or permission of EDUC-Human Development and Quantitative Methodology department.
Repeatable to: 6 credits if content differs.

EDHD888 Apprenticeship in Human Development Research (1-8 Credits)
Apprenticeship in Human Development research.
Restriction: Permission of EDUC-Human Development and Quantitative Methodology department.

EDHD889 Practicum in Human Development (3-9 Credits)
Field experience in applied human development at a professional level of competence in a particular role with appropriate supervision.
Prerequisite: Credit not to be granted for experience accrued prior to registration; and open only to degree and certificate-seeking graduate students.
Restriction: Permission of EDUC-Human Development and Quantitative Methodology department.
Repeatable to: 9 credits if content differs.

EDHD898 Pre-Candidacy Research (1-8 Credits)

EDHD899 Doctoral Dissertation Research (1-8 Credits)
Registration required to 12-18 hours for a Ph.D. dissertation.

EDHI - Education Leadership, Higher Ed and International Ed

EDHI488 Special Topics in Education Policy and Administration (1-3 Credits)
Special and intensive treatment of current topics and issues in education policy and administration.
Restriction: Permission of EDUC-Counseling, Higher Education and Special Education department.
Repeatable to: 6 credits.
Formerly: EDPL488.

EDHI489 Field Experiences in Education (1-4 Credits)
Planned field experience in education-related activities. Credit not to be granted for experiences accrued prior to registration.
Restriction: Permission of EDUC-Counseling, Higher Education and Special Education department.
Formerly: EDPL489.

EDHI498 Special Problems in Education (1-3 Credits)
Available only to students who have definite plans for individual study of approved problems.
Prerequisite: Available only to students who have definite plans for individual study of approved problems.
Restriction: Permission of EDUC-Counseling, Higher Education and Special Education department.
Formerly: EDPL498.

EDHI499 Workshops, Clinics, and Institutes (1-6 Credits)
The following type of educational enterprise may be scheduled under this course heading: Workshops conducted by the College of Education (or developed cooperatively with other colleges and universities) and not otherwise covered in the present course listing; clinical experiences in pupil-testing centers, reading clinics, speech therapy laboratories, and special education centers; institutes developed around specific topics or problems and intended for designated groups such as school superintendents, principals, and supervisors.
Repeatable to: 6 credits.
Formerly: EDPA499.

EDHI605 Comparative Education (3 Credits)
Analyzes and compares leading issues in education in various countries of the world, particularly as they relate to crucial problems in American education.
Credit Only Granted for: EDHI605, EDPL605, or EDPS605.
Formerly: EDPL605.

EDHI606 Political Economy of Education in a Global Context (3 Credits)
Examination of alternative economics perspectives and their implications for education policy and practice internationally, from local to global levels. The connection of education to issues of development, inequality, poverty, gender, and race will be discussed.
Credit Only Granted for: EDHI606, EDPL606, or EDPS606.
Formerly: EDPL606.

EDHI607 Culture and Education in a Global Context (3 Credits)
Examines cultural theories and analyzes cultural influences in education. Course materials and discussion critically analyze cultural transmission and schooling practices. Also examined are politics of culture, multiculturalism, global cultural clashes, and educators as critical culture workers.
Credit Only Granted for: EDHI607, EDPL607, or EDPS607.
Formerly: EDPL607.

EDHI608 Gender and Education (3 Credits)
The course examines feminist theories on gender inequity, and analyzes social impacts on girls' and women's education. Also examined are women's ways of knowing, issues of race and class, gender and development, ecofeminism, and technology for women.
Credit Only Granted for: EDPL788B or EDPL608.
Formerly: EDPL608.

EDHI630 Analyzing Systemwide Education Policy (3 Credits)
Analysis of how assessments are made of systemwide education policy based on the approaches used in studies of national education policy by international agencies.
Credit Only Granted for: EDHI630, EDPL630, or EDPS630.
Formerly: EDPL630.

EDHI650 Professional Seminar in Higher and Adult Education (3 Credits)
Introduction to higher and adult education as a field of study. Origins, current dimensions and problems, and emerging issues. Field trips to state and national capitols, and involvement in professional conferences.
Credit Only Granted for: EDHI650, EDPL650, or EDPS650.
Formerly: EDPL650.

EDHI652 Higher Education in American Society (3 Credits)
Examines the concepts of academic freedom, corporate autonomy and institutional accountability with emphasis on twentieth century relationships between higher education and government in the United States.
Credit Only Granted for: EDHI652, EDPL652, or EDPS652.
Formerly: EDPL652.

EDHI653 Organization and Administration of Higher Education (3 Credits)
Basic concepts and terminology related to organizational behavior and institutional governance structures. The governance and organization of higher education in the United States.
Credit Only Granted for: EDHI653, EDPL653, or EDPS653.
Formerly: EDPL653.

EDHI664 The College Experience (3 Credits)
Designed to provide students with an overview of the research and scholarship on two of the major stakeholders in higher education -- students and faculty. Examines the educational experiences of college students in and out of the classroom in higher education in the United States by focusing on what students learn and the different collegiate experiences that influence their learning.
Credit Only Granted for: EDHI664, EDPL664, or EDPS664.
Formerly: EDPL664.

EDHI665 College Access and Choice (3 Credits)
Examines the college-going process, how and why some students successfully navigate it, and what policies and programs can help students from disadvantaged or underrepresented backgrounds overcome barriers to college access and entry.
Credit Only Granted for: EDHI665 or EDHI788L.
Formerly: EDHI788L.

EDHI666 The Academic Profession (3 Credits)
Explores how faculty demographics, discipline, graduate socialization, and organizational context (institutional type, mission, and culture) matter to critical higher edcuation outcomes, such as student learning, community engagement, research, shared governance and access and equity.
Credit Only Granted for: EDHI666 or EDHI788P.
Formerly: EDHI788P.

EDHI667 Women in Higher Education (3 Credits)
A comprehensive overview of the history, present condition, and current research on women students, faculty, adminstrators, and staff in higher education. Explores why and how women and men experience higher educaton differently, by drawing on historical, cultural, and psychological contexts, feminist theoretical and research perspectrives and recent research in various disciplines.
Credit Only Granted for: EDHI667 or EDHI788A.
Formerly: EDHI788A.

EDHI672 Modes of Inquiry in Education Research (3 Credits)
Introduction to modes of inquiry appropriate to research on issues and problems in education. Examination of qualitative, quantitative and mixed research methods and designs with a focus on related standards of quality.
Restriction: Must be in a program in the Counseling, Higher Education, or Special Education department; or permission of the instructor.
Credit Only Granted for: EDHI672 or EDPS672.

EDHI673 Economic Evaluation of Education (3 Credits)
Examination and application of economic approaches - cost, cost-effectiveness, and cost-benefit analysis - to the evaluation of education programs and policies.
Credit Only Granted for: EDHI673, EDPL673, or EDPS673.
Formerly: EDPL673.

EDHI677 Ranking System in Higher Education: How They Work and Why They Matter (3 Credits)
A critical examination of domestic and international university rankings systems from their historic origins to current day. Students explore the criteria used to identify quality, the methods used to collect data, and the impact of ranking systems on institutional decision-making.
Credit Only Granted for: EDHI677 or EDHI788W.
Formerly: EDHI788W.

EDHI679 Master's Seminar (3 Credits)
Directed study for master's degree students writing seminar papers.
Formerly: EDPL679.

EDHI680 Gender, Development, and Education (3 Credits)
Focusing on gender as an analytical frame and a discrete variable, a comprehensive view of the relationship between gender and education in the context of national development is presented. It identifies the conditions of men and women's education and policy efforts to promote equity and social transformation.
Credit Only Granted for: EDHI674, EDHI680 or EDHI788K.
Formerly: EDHI788K.

EDHI681 Education for Global Peace (3 Credits)
This course will examine how education can address the threats of violence and wars. It prepares students to teach about peace, nonviolence, and conflict resolution, and also to analyze and implement changes in school and society to contribute to peace and non-violence.
Credit Only Granted for: EDHI681, EDPL681, or EDPS681.
Formerly: EDPL681.

EDHI682 Ecological Ethics and Education (3 Credits)
An exploration of the paradigms, approaches, and ways of knowing offered through ecological ethics and environmental sustainability education.
Credit Only Granted for: EDHI682 or EDHI788E.
Formerly: EDHI788E.

EDHI683 World Religions and Their Implications for Education (3 Credits)
Students develop a basic understanding of world religions, looking at their orgins, development, teachings, and primary figures. Students explore the roles, meaning, purpose that education plays in the various religions and examine their implications for education in the 21st century.
Credit Only Granted for: EDHI683 or EDHI788C.
Formerly: EDHI788C.

EDHI684 Alternative Education, Alternative Development (3 Credits)
A critical examination of the political economy of education and international development policies and practices. Focus is on the implications of these critiques for alternative education and development policies and practices.
Recommended: EDHI606.
Credit Only Granted for: EDHI684 or EDHI788D.
Formerly: EDHI788D.

EDHI686 International Investigations in Cuban Education: A Fieldwork Practicum (3 Credits)
This intensive research course has three core learning streams. First, our course provides a space for students to engage in international qualitative fieldwork. For many, this will be the first time you are engaging in international fieldwork. We will explore methods and various qualitative practices in the course before enacting these practices in the international arena. Secondly, our course aims to build each student's understanding of our research site by exploring aspects of the political, cultural and historical context. Lastly, our course is designed to be a reciprocal exchange between education scholars and practitioners in both countries. We will survey the history and key aspects of education policy while also sharing our research interests and experiences from our educational contexts.
Credit Only Granted for: EDHI788X, EDHI798B, or LACS648C.
Formerly: EDHI788X.
Additional Information: This is a spring semester course with travel over spring break. Students must apply through Education Abroad. Knowledge of Spanish is helpful but not required.

EDHI687 International Education & Cultural Exchange: Policies & Practices (3 Credits)
This course introduces students to various aspects of academic exchange with an emphasis on internationalization efforts of universities & current emerging trends due to recent political & health contexts. Students will engage leaders in the field to connect course content to current issues.
Credit Only Granted for: EDHI788T or EDHI687.
Formerly: EDHI788T.
Additional Information: This is a Global Classrooms course, developed in partnership with the Global Learning Initiatives Office (GLI) in the Office of International Affairs (OIA) to provide virtual opportunities for global engagement. Additionally, this course is a part of the Civic Engagement Across the Curriculum (CEAC) at UMD, which is a program designed to support the integration of civic engagement experiences into any course, regardless of discipline.

EDHI689 Practicum In Educational Administration and Supervision (1-3 Credits)
Promotes skill development in managerial, leadership and supervisory areas. Practicum is based on results of diagnostic instruments and an individual professional development plan.
Repeatable to: 3 credits if content differs.
Formerly: EDPL689.

EDHI700 Qualitative Research Methods in Education (3 Credits)
Qualitative methods in education research, emphasizing the paradigms of philosophy, history, sociology, anthropology, and comparative studies as they rely on narrative rather than quantitative ordering of data.
Credit Only Granted for: EDHI700, EDPL700, or EDPS700.
Formerly: EDPL700.

EDHI704 Issues and Institutions in International Educational Development (3 Credits)
Examines the role of educational institutions in international development and the issues involved in educational planning and policymaking at the local, national and international levels.
Credit Only Granted for: EDHI704, EDPL704, or EDPS704.
Formerly: EDPL704.

EDHI710 Globalization and Education (3 Credits)
Multiple education policies, practices, and innovations linked to economic, technological, and cultural dimensions of globalization are affecting education systems. The consequences of such forces on educational equality, equity, and quality, noting similarities and differences between industrialized and developing countries will be explored.
Recommended: EDHI605.
Credit Only Granted for: EDHI710 or EDHI788J.
Formerly: EDHI788J.

EDHI725 Education in East Asia (3 Credits)
The course traces the cultural and intellectual history of education in East Asia, and examine features and important issues in East Asian education systems. School reform and social changes are studied.
Credit Only Granted for: EDHI725, EDPL725, or EDPS725.
Formerly: EDPL725.

EDHI750 International Higher Education (3 Credits)
Comparison of higher education systems in several countries, and of the problems and issues in higher education faced by these countries.
Credit Only Granted for: EDHI750, EDPL750, or EDPS750.
Formerly: EDPL750.

EDHI752 State Systems of Higher Education (3 Credits)
Creation, operation, alteration and evaluation of state systems of higher education. Campus autonomy versus public accountability. Analysis of topics such as state planning, budget and program review, and administration of student aid and federal programs.
Credit Only Granted for: EDHI752, EDPL752, or EDPS752.
Formerly: EDPL752.

EDHI754 Higher Education Finance (3 Credits)
Economic perspectives on higher education. Ways of financing higher education and current finance issues. Higher education budget concepts and processes.
Credit Only Granted for: EDHI754, EDPL754, or EDPS754.
Formerly: EDPL754.

EDHI759 Seminar in Adult and Continuing Education (3 Credits)
Current issues and problems in adult and continuing education and lifelong learning in America.
Formerly: EDPL759.

EDHI788 Special Topics in Education Policy and Administration (1-3 Credits)
Special and intensive treatment of current topics and issues in education policy and administration.
Restriction: Permission of EDUC-Counseling, Higher Education and Special Education department.
Repeatable to: 6 credits.

EDHI789 Doctoral Practicum in Administration and Supervision (1-3 Credits)
Experiential activities designed to enhance student skills. Based on Individual Professional Development Plan for each student.
Repeatable to: 3 credits if content differs.
Formerly: EDPL789.

EDHI798 Special Problems in Education (1-6 Credits)
Master's, AGS, or doctoral candidates who desire to pursue special research problems under the direction of their advisors may register for credit under this number.
Formerly: EDPL798.

EDHI799 Master's Thesis Research (1-6 Credits)
Formerly: EDPL799.

EDHI805 Seminar in Comparative Education (3 Credits)
Analysis of educational issues on a worldwide basis with opportunities to focus on a particular country on an individual basis. Analysis of qualitative research methods as used in cross-cultural and comparative education studies.
Credit Only Granted for: EDHI805, EDPL805, or EDPS805.
Formerly: EDPL805.

EDHI839 Seminar in Teacher Education (3-6 Credits)
A problem seminar in teacher education.
Repeatable to: 6 credits.
Formerly: EDPL839.

EDHI853 Leadership in Higher Education (3 Credits)
Theories of organizational leadership applied to institutions of higher education.
Prerequisite: EDHI653.
Credit Only Granted for: EDHI853, EDPL853, or EDPS853.
Formerly: EDPL853.

EDHI855 Lifelong Learning Policy (3 Credits)
Policies and programs for training and continued learning in business and industry, government agencies, unions, professional societies, and nonprofit organizations.
Credit Only Granted for: EDHI855, EDPL855, or EDPS855.
Formerly: EDPL855.

EDHI888 Apprenticeship in Education (1-8 Credits)
Apprentice practice under professional supervision in an area of competence compatible with the student's professional goals. Credit not to be granted for experience accrued prior to registration. Open only to degree- and certificate-seeking graduate students.
Restriction: Permission of EDUC-Counseling, Higher Education and Special Education department.
Formerly: EDPL888.

EDHI889 Internship in Education (3-8 Credits)
Internship experiences at a professional level of competence in a particular role with appropriate supervision. Credit not to be granted for experience accrued prior to registration. Open only to students advanced to candidacy for doctoral degree.
Restriction: Permission of EDUC-Counseling, Higher Education and Special Education department.
Formerly: EDPL889.

EDHI895 Research Critique Seminar (3 Credits)
Critiques of research designs in preparation for the doctoral dissertation.
Credit Only Granted for: EDHI895, EDPL895, or EDPS895.
Formerly: EDPL895.

EDHI898 Pre-Candidacy Research (1-8 Credits)
Formerly: EDPL898.

EDHI899 Doctoral Dissertation Research (1-8 Credits)
Registration required to the extent of 6-9 hours for an Ed.D. Project and 12-18 hours for a Ph.D. Dissertation.
Formerly: EDPL899.

EDMS - Measurement, Statistics, and Evaluation

EDMS410 Classroom Assessment (3 Credits)
Developing and using classroom assessments, including tests, performance assessments, rating scales, portfolios, observations and oral interactions; basic psychometric statistics; standard setting; grading; communicating assessment information; testing ethics; locating and evaluating measures; program evaluation and classroom research; assessments used for educational policy decisions.
Restriction: Junior standing or higher.

EDMS451 Introduction to Educational Statistics (3 Credits)
Introduction to statistical reasoning; location and dispersion measures; computer applications; regression and correlation; formation of hypotheses tests; t-test; one-way analysis of variance; analysis of contingency tables.
Restriction: Sophomore standing or higher.

EDMS489 Field Experiences in Measurement and Statistics (1-4 Credits)
Planned field experience in education-related activities. Credit not to be granted for experiences accrued prior to registration.
Restriction: Permission of EDUC-Human Development and Quantitative Methodology department.
Repeatable to: 4 credits.

EDMS498 Special Problems in Measurement and Statistics (1-3 Credits)
Available only to education majors who have formal plans for individual study of approved problems.
Prerequisite: Available only to education majors who have formal plans for individual study of approved problems.
Restriction: Permission of EDUC-Human Development and Quantitative Methodology department.
Repeatable to: 6 credits.

EDMS610 Classroom Assessment and Evaluation (3 Credits)
Develop the understandings and skills needed to validly, reliably, and accurately assess student learning and to provide focused leadership in the area of classroom assessment.

EDMS623 Applied Measurement: Issues and Practices (3 Credits)
Measurement theory and its application at an intermediate level; test development, validation and interpretation; issues and recent developments in measurement.
Prerequisite: EDMS410. And EDMS645; or students who have taken courses with comparable content may contact the department.

EDMS626 Instrumentation (3 Credits)
Theory, development, and applications of various affective, cognitive, or behavioral measurement instruments and procedures, including questionnaire and test items, observational protocols, and cutting-edge innovative game and scenario-based assessments.
Prerequisite: EDMS623.

EDMS645 Quantitative Research Methods I (3 Credits)
Research design and statistical applications in educational research: data representation; descriptive statistics; estimation and hypothesis testing. Application of statistical computer packages is emphasized.

EDMS646 General Linear Models I (3 Credits)
A first post-introductory inferential statistics course, with emphasis on analysis of variance procedures and designs from within the general linear modeling framework. Assignments include student analysis of education and related data; application of statistical software packages is emphasized.
Prerequisite: EDMS645; or an equivalent introductory statistics course.

EDMS647 Causal Inference and Evaluation Methods (3 Credits)
Counterfactual (potential outcomes) framework for causal inference, design/analysis strategies for confounder control, and specific best-practice applications to the evaluation of programs.
Prerequisite: Must have completed or be concurrently enrolled in EDMS651.

EDMS651 General Linear Models II (3 Credits)
Multiple regression and correlation analysis; trend analysis; hierarchical and stepwise procedures; logistic regression; software for regression analysis.
Prerequisite: EDMS646; or students who have taken courses with comparable content may contact the department.

EDMS655 Introduction to Multilevel Modeling (3 Credits)
Introduction to multilevel models and methodology as strategies for modeling change and organizational effects.
Prerequisite: EDMS651; or students who have taken courses with comparable content may contact the department.

EDMS657 Exploratory Latent and Composite Variable Methods (3 Credits)
Development of models for exploratory factor analysis and their practical applications. Additional topics will draw from latent class analysis, cluster analysis, mixture models, canonical correlation, multidimensional scaling, and configural frequency analysis.
Prerequisite: EDMS651.

EDMS665 Data Analysis and Statistical Consulting (3 Credits)
Advanced data analysis procedures applied to real-world clients' problems arising in a wide variety of substantive research settings within and beyond education.
Prerequisite: EDMS651; or students who have taken courses with comparable content may contact the department.

EDMS722 Structural Modeling (3 Credits)
Statistical theory and methods of estimation used in structural modeling; computer program applications; multisample models; mean structture models; structural models with multilevel data (e.g., sampling weights, growth models, multilevel latent variable models).
Prerequisite: EDMS657.

EDMS724 Modern Measurement Theory (3 Credits)
Theoretical formulations of measurement from a latent trait theory perspective.
Prerequisite: EDMS623 and EDMS651.

EDMS738 Seminar in Special Problems in Measurement (1-3 Credits)
An opportunity for students with special interests to focus in depth on contemporary topics in measurement. Topics to be announced, but will typically be related to applied and theoretical measurement.
Restriction: Permission of EDUC-Human Development and Quantitative Methodology department.
Repeatable to: 3 credits.

EDMS747 Design of Program Evaluations (3 Credits)
Analysis of measurement and design problems in program evaluations.
Prerequisite: EDMS626, EDMS651, and EDMS647. Or permission of instructor; and permission of EDUC-Human Development and Quantitative Methodology department.

EDMS769 Special Topics in Applied Statistics in Education (1-4 Credits)
Designed primarily for students majoring or minoring in measurement, statistics or evaluation.
Restriction: Permission of EDUC-Human Development and Quantitative Methodology department.

EDMS771 Multivariate Data Analysis (3 Credits)
Principal components, canonical correlation, discriminant functions, multivariate analysis of variance/covariance and other multivariate techniques.
Prerequisite: EDMS651.

EDMS779 Seminar in Applied Statistics (1-3 Credits)
Enrollment restricted to students with a major or minor in measurement, statistics or evaluation. Seminar topics will be chosen by individual student interest.
Restriction: Permission of EDUC-Human Development and Quantitative Methodology department. And must be in Measurement, Statistics and Evaluation (Master's) program; or must be in Measurement, Statistics and Evaluation (Doctoral) program.
Repeatable to: 3 credits if content differs.

EDMS787 Bayesian Inference and Analysis (3 Credits)
Models and model fitting methods commonly used in Bayesian Inference, such as Markov Chain Monte Carlo methods (e.g., Gibbs, Metropolis Sampling), with applications within and beyond the social and behavioral sciences. Analytical and philosophical differences between Frequentist and Bayesian statistics will also be highlighted.
Prerequisite: EDMS779 or permission of the instructor.
Credit Only Granted for: EDMS769B or EDMS787.
Formerly: EDMS769B.

EDMS798 Special Problems in Education (1-6 Credits)
Master's, EDMS majors, or doctoral candidates who desire to pursue special research problems under the direction of their advisors may register for credit under this number.
Restriction: Must be in Measurement, Statistics and Evaluation (Master's) program; or must be in Measurement, Statistics and Evaluation (Doctoral) program.

EDMS799 Master's Thesis Research (1-6 Credits)
Registration required to the extent of 6 credits.
Restriction: Must be in a major within the EDUC-Human Development and Quantitative Methodology department.

EDMS879 Doctoral Seminar (1-3 Credits)
Seminar that supports analysis of doctoral projects and theses, and of other on-going research projects.
Restriction: Permission of EDUC-Human Development and Quantitative Methodology department.

EDMS889 Internship in Measurement and Statistics (3-12 Credits)
Provides internship experiences at a professional level of competence in a particular role with appropriate supervision. Credit not to be granted for experience accrued prior to registration. Open only to students advanced to candidacy for doctoral degree.
Prerequisite: Open only to students advanced to candidacy for doctoral degree.
Restriction: Permission of EDUC-Human Development and Quantitative Methodology department.

EDMS898 Pre-Candidacy Research (1-8 Credits)

EDMS899 Doctoral Dissertation Research (1-8 Credits)
Registration required to the extent of 12 credits.

EDPS - Education Policy Studies

EDPS401 Educational Policy, and Social Change (3 Credits)
An examination of education policy in relation to the social environment and change. Contemporary education and social issues are examined, including technology as a complex force which influences social change. This is a Social Foundations course.
Credit Only Granted for: EDPL401 or EDPS401.
Formerly: EDPL401.

EDPS623 Education Policy and Theories of Change (3 Credits)
The work of change theorists in history, economics, political science, philosophy, sociology and anthropology as it impinges upon education policy.
Credit Only Granted for: EDHI623, EDPL623, or EDPS623.
Formerly: EDPL623.

EDPS626 Educatin Policy and the Young (3 Credits)
The systematic exploration of education policy as it has organized, reflected and influenced the lives of children, youth, and families, with particular emphasis on American policies and systems.
Credit Only Granted for: EDHI626, EDPL626, or EDPS626.
Formerly: EDPL626.

EDPS636 Communication and the School Curriculum (3 Credits)
Curriculum development based on communication as the major vehicle for describing the learner's interactions with persons, knowledge, and materials in the classroom and school environment.
Credit Only Granted for: EDHI636, EDPL636, or EDPS636.
Formerly: EDPL636.

EDPS712 Analysis of Educational Concepts (3 Credits)
Analyses of selected concepts used in thinking about education.
Credit Only Granted for: EDHI712, EDPL712, or EDPS712.
Formerly: EDPL712.

EDPS811 Seminar in History of Education (3 Credits)
Examination of current developments and continuing controversies in the field of history of education. The analysis of the various ways in which history of education is approached methodologically and interpretatively.
Credit Only Granted for: EDHI811, EDPL811, or EDPS811.
Formerly: EDPL811.

EDPS812 Seminar in Philosophy of Education (3 Credits)
Examination of current developments and continuing controversies in the field of philosophy of education. The function of educational philosophy, methodological approaches, and current research trends.
Credit Only Granted for: EDHI812, EDPL812, or EDPS812.
Formerly: EDPL812.

EDPS813 Seminar in Educational Sociology (3 Credits)
Sociological analysis of educational processes and institutions; emphasis on the social effects of formal organizations.
Credit Only Granted for: EDHI813, EDPL813, or EDPS813.
Formerly: EDPL813.

EDSP - Education, Special

EDSP400 Instruction of Students with Severe Disabilities I (3 Credits)
Functional assessment procedures and instructional methods for students with severe disabilities.
Restriction: Must be in Special Education program. Jointly offered with EDSP602.
Credit Only Granted for: EDSP400 or EDSP602.

EDSP401 Teaching Students with Disabilities in Elementary Classrooms (3 Credits)
This course is designed for elementary education majors to prepare for teaching students with disabilities in elementary classrooms. The course examines the legal requirements for general education teachers in the public schools including best practices for participating in the Individual Education Program (IEP) team process, and understanding Response to Intervention (RTI) as a approach to the early identification and support of students with learning and behavior needs. Information is provided on the characteristics of students who have been identified as having high incidence disabilities (e.g., learning disabilities, attention deficit hyperactivity disorder, speech and language delays, emotional or behavioral disorders, and other health impairments). The course then provides information on universal design (UDL) principles for learning, instructional suggestions to include students with disabilities in the general classroom, co-teaching and methods for integrating technology and assistive technology to benefit all students.
Restriction: Permission of EDUC-Special Education department.
Credit Only Granted for: EDSP401 or EDSP499F.
Formerly: EDSP499F.

EDSP402 Field Placement: Severe Disabilities I (1 Credit)
Practicum experience in settings serving students with severe disabilities.
Restriction: Permission of EDUC-Counseling, Higher Education and Special Education department.

EDSP403 Supporting Access for Students with Multiple Disabilities Across Settings (3 Credits)
Knowledge and practices in characteristics of multiple disabilities, assessment, individualized educational programming, universal design processes for instruction, assistive technology, environmental accessibility, and collaboration.
Prerequisite: EDSP400 or EDSP602.
Jointly offered with: EDSP603.
Credit Only Granted for: EDSP403 or EDSP603.

EDSP404 Methods of Teaching Autistic Students (3 Credits)
Characteristics of children and youth diagnosed with an autism spectrum disorder (ASD), assessment, and evidence-based instructional methods in teaching autistic students who come from diverse ethnic, cultural, and socio-economic backgrounds.
Jointly offered with: EDSP604.
Restriction: Permission of EDUC-Counseling, Higher Education and Special Education department.
Credit Only Granted for: EDSP404 or EDSP604.

EDSP410 Instruction of Students with Severe Disabilities II (3 Credits)
Functional assessment, curriculum, and instruction related to academic and community functioning skills for students with severe disabilities.
Restriction: Must be in Special Education program. Jointly offered with EDSP614.
Credit Only Granted for: EDSP410 or EDSP614.

EDSP411 Foundations of Technology Integration for Curriculum Access (3 Credits)
Addresses ways to integrate technology and Assistive Technology (AT) into content area instruction, use Accessible Educational Materials (AEM), and the Universal Design for Learning (UDL) framework to evaluate, analyze, and develop responsive instruction.
Prerequisite: EDSP210 or EDSP470.
Restriction: Must be in Special Education program.

EDSP413 Principles and Practices in Positive Behavior Interventions and Classroom Supports (3 Credits)
Use of positive behavior supports to promote both classwide and individual student behavior skills through function-based behavior assessment, establishing classroom expectations, and examining common misbehaviors that often result in learning loss.
Jointly offered with: EDSP613.
Restriction: Must be in Special Education program.
Credit Only Granted for: EDSP413 or EDSP613.

EDSP415 Assessment Techniques and Practices in Special Education (3 Credits)
Knowledge and skills for understanding assessment process and interpretation of assessment data. Emphasis on psychometric aspects of assessment related to screening, eligibility, and intervention planning within a Multi-Tiered System of Supports (MTSS).
Recommended: STAT100; or SOCY201.
Jointly offered with: EDSP615.
Restriction: Must be in Special Education program.
Credit Only Granted for: EDSP415 or EDSP615.

EDSP416 Reading and Writing Instruction in Special Education I (3 Credits)
Assessment and instruction of reading and writing skills for students in special education.
Restriction: Must be in Special Education program. Jointly offered with EDSP616.
Credit Only Granted for: EDSP416 or EDSP616.

EDSP417 Reading Diagnosis and Assessment (3 Credits)
Reading Diagnosis and Assessment prepares teacher candidates to assess children in general and special early childhood educations settings in the areas of reading and writing in order to plan for instruction. The course will focus on diagnostic, screening, progress monitoring, and outcome assessments in early and beginning literacy. The course is designed to provide participants with the knowledge and skills necessary to collect and use a wide range of assessment data in general education and special education settings. Includes field experience.
Prerequisite: EDSP423, EDHD431, and EDSP315; and track 1: Must have completed EDSP430 and EDSP433; OR Track 2: Must have completed EDHD415 and EDHD424.
Corequisite: EDHD322, EDHD323, EDSP321, EDHD441, EDHD442, EDHD443, and EDHD444.

EDSP420 Child Development, Birth to Three Years (3 Credits)
Designed to provide students with an understanding of child development theory and research, as well as knowledge about typical and atypical development of children from birth to three years of age. The course emphasizes learning for children with and without disabilities, and for children who are at risk due to poverty and other environmental factors. The course will introduce how children develop and the challenges they face within the domains of physical, cognitive, language, social, and emotional development, with particular attention paid to the impact of risk factors on development. Students will become familiar with delays and differences in development that may occur as the result of disability. Finally, students will learn the effects of cultural and linguistic differences on growth and development. Information about theory and research in child development for children with and without disabilities will be enhanced through a series of observational experiences, which will build upon concepts addressed during class. Includes field experiences.
Prerequisite: EDHD210, EDHD220, and EDSP211.
Corequisite: EDHD314 and EDHD425.
Cross-listed with: EDHD434.
Credit Only Granted for: EDHD419A, EDSP420 or EDHD434.
Formerly: EDHD419A.

EDSP422 Curriculum and Instruction: Early Childhood Special Education (3 Credits)
Curriculum and instruction for young children with mild and moderate disabilities, preschool through primary grades.
Restriction: Must be in Special Education program. Jointly offered with EDSP627.
Credit Only Granted for: EDSP422 or EDSP627.

EDSP423 Assessment in Early Childhood Special Education (3 Credits)
Assessment procedures for infants and young children with disabilities, birth through grade 3.
Restriction: Must be in Special Education program.
Credit Only Granted for: EDSP423 or EDSP624.

EDSP425 Pre-Internship I (1 Credit)
This required EDSP field placement is a 3-hour per week seminar and field placement that meets across 15 weeks. Opportunities are provided to observe and participate in instructional experiences under the guidance of an assigned Host Teacher (HT) in a four-week experience in a high incidence placement AND a four-week experience in a low incidence (LI) placement. The purpose is to provide each special education teacher candidate (TC) with practical experience to complete field-based requirements and begin to meet the CEC Initial Preparation Standards (2012). Furthermore, since EDSP 425 is the first internship experience in the Special Education Program in the College of Education at University of Maryland, teacher candidates will become familiar with the Special Education Program, College of Education, Maryland State Department of Education (MSDE), Counsel for Accreditation of Educator Preparation (CAEP), and Council for Exceptional Children (CEC) expectations and requirements for graduation and teacher licensure.
Corequisite: EDSP451 and EDSP400.
Restriction: Must be in the Special Education major.

EDSP426 Pre-Internship II (1 Credit)
A 3-hour per week seminar and field placement that meets across 15 weeks. Teacher candidates will assess and provide instruction for first grade students at a local public elementary school. The field experience is also supported through content delivered in EDSP 415/615 (Assessment in Special Education) and EDSP 416/616 (Reading and Writing Instruction in Special Education). The tutoring program is meant to provide an opportunity for teacher candidates to practice the assessment and instructional skills they are learning, while also providing a needed service to the community. Teacher candidates will work one-on-one with select first graders whose teachers have determined to be in need of extra support in reading and writing.
Corequisite: EDSP415 and EDSP416.
Restriction: Must be in the Special Education major.

EDSP430 Early Intervention: Early Childhood Special Education (3 Credits)
Intervention with infants and young children with disabilities. Focus on moderate and severe disabilities.
Restriction: Must be in Special Education program.
Credit Only Granted for: EDSP430 or EDSP631.

EDSP433 Families and Culture in Early Intervention (Birth-5) (3 Credits)
Provides students with the skills and information they need to work effectively with families of young children (birth to age 5) who have or are at risk for disabilities in early childhood or early intervention programs. Students will review current local, state and federal policies establishing the rights of families of infants and young children with disabilities to participate in decision making for their child. We will discuss relevant theoretical and research literature as well as the cultural and contextual issues involved in working with families of very young children. Includes field experiences.
Prerequisite: EDHD314 and EDHD425; and (EDHD419 or EDSP420).
Corequisite: EDSP430, EDSP315, and EDHD431.

EDSP443 Language and Literacy Acquisition in Children with Disabilities (3 Credits)
Language and literacy acquisition and characteristics of typical and atypical language development in supporting students with reading and writing disabilities.
Restriction: Must be in Special Education program.
Additional Information: This course is the first of four reading courses required by the Maryland State Department of Education for teacher certification in Special Education.

EDSP451 Curriculum and Instruction: Elementary/Middle Special Education (3 Credits)
Methods for instruction of students with disabilities in the general education curriculum. Collaboration with other professionals is included.
Restriction: Must be in Special Education program. Jointly offered with EDSP652.
Credit Only Granted for: EDSP451 or EDSP652.

EDSP452 Internship I: Elementary/Middle Special Education (2-4 Credits)
Field experience in elementary/middle school special education.
Restriction: Must be in Special Education program. Jointly offered with EDSP692.
Credit Only Granted for: EDSP452 or EDSP692.

EDSP470 Introduction to Special Education (3 Credits)
Designed to give an understanding of the needs of all types of exceptional children.
Restriction: Must not have completed EDSP210.
Credit Only Granted for: EDSP210, EDSP211 or EDSP470.

EDSP484 Reading and Writing Instruction in Special Education II (3 Credits)
Focus on the development of reading and writing programs for students in special education. Builds on foundations established in EDSP416.
Prerequisite: EDSP416.
Restriction: Must be in Special Education program. Jointly offered with EDSP684.
Credit Only Granted for: EDSP484 or EDSP684.

EDSP485 Assessment and Instruction in Mathematics in Special Education (3 Credits)
Instructional methods and assessment in mathematics in special education.
Restriction: Must be in Special Education program; or must be in one of the following programs (Special Education (Doctoral); Special Education (Master's)). Jointly offered with EDSP683.
Credit Only Granted for: EDSP485 or EDSP683.

EDSP486 Promoting Prosocial Behavior in Special Education (3 Credits)
Focus on social development among students with and without disabilities, the relationship between pedagogy and student behavior, and classroom, school, and community approaches for developing prosocial behavior.
Jointly offered with: EDSP686.
Credit Only Granted for: EDSP486 or EDSP686.

EDSP487 Collaborative Partnerships in Special Education (3 Credits)
Strategies for positively collaborating with families, practitioners, and community stakeholders to implement Specially Designed Instruction (SDI) for students with disabilities.
Jointly offered with: EDSP687.
Restriction: Must be in Special Education program.
Credit Only Granted for: EDSP487 or EDSP687.

EDSP488 Selected Topics in Teacher Education (1-3 Credits)
Restriction: Permission of EDUC-Counseling, Higher Education and Special Education department; or must be in a major in EDUC-College of Education.
Repeatable to: 6 credits if content differs.

EDSP489 Field Experiences in Special Education (1-4 Credits)
Planned field experience in education-related activities. Credit not to be granted for experiences accrued prior to registration.
Restriction: Permission of EDUC-Counseling, Higher Education and Special Education department.

EDSP490 Teacher Candidate Research Seminar in Special Education (3 Credits)
Study of current issues and research concerning the education of students in special education.
Restriction: Must be in Special Education program.

EDSP495 Internship II: Elementary/Middle Special Education (6-12 Credits)
Internship II is a full-time 15 week field-placement experience in a local school system working with students with disabilities in an elementary or middle school environment. Internship II allows the intern to apply and integrate teaching competencies and responsibilities by systematically increasing independence in conducting all aspects of the special education mentor teacher's role. The intern will incrementally assume responsibility for planning, instruction, management, collaboration, and other essential tasks assigned in their internship placement. The intern will be responsible for the successful completion of edTPA, seminar assignments, and self-evaluation using Live Text for Foundational Competencies (FCs) and the Performance Based Assessment (PBA). Interns will be asked to recall and integrate course content from their prerequisite coursework during seminar and their field placement experience.
Corequisite: EDSP490.
Jointly offered with: EDSP695.
Restriction: Must be in Special Education program; or must be in one of the following programs (Special Education (Doctoral); Special Education (Master's)).
Credit Only Granted for: EDSP495 or EDSP695.

EDSP498 Special Problems in Special Education (1-6 Credits)
Available only to education majors who have definite plans for individual study of approved problems. Credit according to extent of work.
Prerequisite: Available only to education majors who have definite plans for individual study of approved problems.
Restriction: Permission of EDUC-Counseling, Higher Education and Special Education department.

EDSP499 Workshops, Clinics, and Institutes in Special Education (1-6 Credits)
The following type of educational enterprise may be scheduled under this course heading: workshops conducted by the special education department (or developed cooperatively with other departments, colleges and universities) and not otherwise covered in the present course listing. Laboratories, and special education centers; institutes developed around specific topics or problems and intended for designated groups such as school superintendents, principals and supervisors.
Repeatable to: 6 credits if content differs.

EDSP600 Issues and Trends in Educating Individuals with Disabilities (3 Credits)
Examines research and practice relevant to the education of individuals with disabilities.
Prerequisite: 9 credits in EDSP courses.
Restriction: Permission of EDUC-Counseling, Higher Education and Special Education department.

EDSP601 Special Education for School Counselors (3 Credits)
Designed to give school counseling students an understanding of the needs of children with disabilities, and the school-based services that they received. The course focuses on the school counselor's role in identifying and supporting children who have disabilities.
Restriction: Must be in Counseling and Personnel Services (Master's) program.
Credit Only Granted for: EDSP470 or EDSP601.

EDSP602 Instruction of Students with Severe Disabilities I (3 Credits)
Functional assessment procedures and instructional methods for students with severe disabilities.
Restriction: Must be in Special Education (Master's) program.
Credit Only Granted for: EDSP400 or EDSP602.

EDSP603 Supporting Access for Students with Multiple Disabilities Across Settings (3 Credits)
Knowledge and practices in characteristics of multiple disabilities, assessment, individualized educational programming, universal design processes for instruction, assistive technology, environmental accessibility, and collaboration .
Jointly offered with: EDSP403.
Restriction: Must be in Special Education (Doctoral) program; or must be in Special Education (Master's) program.
Credit Only Granted for: EDSP403 or EDSP603.

EDSP604 Methods of Teaching Autistic Students (3 Credits)
Characteristics of children and youth diagnosed with an autism spectrum disorder (ASD), assessment, and evidence-based instructional methods in teaching autistic students who come from diverse ethnic, cultural, and socio-economic backgrounds.
Jointly offered with: EDSP404.
Restriction: Permission of EDUC-Counseling, Higher Education and Special Education department.
Credit Only Granted for: EDSP404 or EDSP604.

EDSP605 The Exceptional Child and Society (3 Credits)
Relationship of the role and adjustment of the child with an exceptionality to societal characteristics.
Prerequisite: EDSP600.
Restriction: Permission of EDUC-Counseling, Higher Education and Special Education department.

EDSP606 Advanced Study in Inclusive Practices in The Schools (3 Credits)
Educational practices regarding inclusive education in the schools for students with and without disabilities.Jointly offered with EDSP450.
Credit Only Granted for: EDSP450, EDSP606 , or EDSP788P.
Formerly: EDSP788P.

EDSP610 Neurodevelopment and Disability for Educators (4 Credits)
Designed for educators of students with disabilities interested in understanding cognition and learning from a neurodevelopmental perspective. Students will be introduced to the basics of neuro-anatomy as well as typical and atypical brain development as it relates to children from birth to age 21.
Restriction: Must be in the Supporting Children with Intensive Behavior Needs in a Public School Setting Post-Baccalaureate Certificate program.

EDSP611 Teaching Students with Disabilities in Elementary Classrooms (2 Credits)
This course is designed for elementary education majors to prepare for teaching students with disabilities in elementary classrooms. The course examines the legal requirements for general education teachers in the public schools including best practices for participating in the Individual Education Program (IEP) team process, and understanding Response to Intervention (RTI) as a approach to the early identification and support of students with learning and behavior needs. Information is provided on the characteristics of students who have been identified as having high incidence disabilities (e.g., learning disabilities, attention deficit hyperactivity disorder, speech and language delays, emotional or behavioral disorders, and other health impairments). The course then provides information on Universal Design for Learning (UDL) principles, instructional suggestions to include students with disabilities in the general classroom, co-teaching and methods for integrating technology and assistive technology to benefit all students.
Restriction: Permission of EDUC-Special Education department.
Credit Only Granted for: EDSP608, EDSP611, EDSP401 or EDSP499F.

EDSP613 Principles and Practices in Positive Behavior interventions and Classroom Supports (3 Credits)
Use of positive behavior supports to promote both classwide and individual student behavior skills through function-based behavior assessment, establishing classroom expectations, and examining common misbehaviors that often result in learning loss.
Jointly offered with: EDSP413.
Restriction: Must be in Special Education (Doctoral) program; or must be in Special Education (Master's) program; or permission of instructor.
Credit Only Granted for: EDSP413 or EDSP613.

EDSP614 Instruction of Students with Severe Disabilities II (3 Credits)
Functional assessment, curriculum, and instruction related to academic and community functioning skills for students with severe disabilities.
Restriction: Must be in Special Education (Master's) program.
Credit Only Granted for: EDSP410 or EDSP614.

EDSP615 Assessment Techniques and Practices in Special Education (1-3 Credits)
Knowledge and skills for understanding assessment process and interpretation of assessment data. Emphasis on psychometric aspects of assessment related to screening, eligibility, and intervention planning within a Multi-Tiered System of Supports (MTSS).
Prerequisite: EDSP600 and EDMS646; or permission of EDUC-Counseling, Higher Education and Special Education department.
Jointly offered with: EDSP415.
Credit Only Granted for: EDSP415 or EDSP615.

EDSP616 Reading and Writing Instruction in Special Education I (3 Credits)
Assessment and instruction of reading and writing skills and strategies for students in special education.
Restriction: Must be in Special Education (Doctoral) program; or must be in Special Education (Master's) program. Jointly offered with EDSP41 6.
Credit Only Granted for: EDSP416 or EDSP616.

EDSP617 Social-Communication Challenges and Strategies for Individuals with Autism Spectrum Disorder and Severe Disabilities (3 Credits)
Provides students with an in-depth analysis of social and communicative challenges typically observed in children with autism spectrum disorder (ASD) and severe disabilities. Theoretical perspectives of communication in individuals with ASD and severe disabilities will be discussed. The application of social-communication evidence-based practices will be emphasized.
Prerequisite: EDSP604; or permission of instructor.
Credit Only Granted for: EDSP617 or EDSP678G.
Formerly: EDSP678G.

EDSP623 Challenges and Issues in Behavioral and Learning Disorders (3 Credits)
Development and outcomes for students with behavioral and learning disorders for inclusive schools, discipline, professional development and ethics.
Prerequisite: EDSP470.
Restriction: Permission of EDUC-Counseling, Higher Education and Special Education department.

EDSP624 Assessment in Early Childhood Special Education (3 Credits)
Assessment procedures for infants and young children with disabilities, birth through age eight.
Restriction: Must be in Special Education (Doctoral) program; or must be in Special Education (Master's) program. Jointly offered with EDSP42 3.
Credit Only Granted for: EDSP423 or EDSP624.

EDSP625 Evidence Based Practices for Individuals with Significant Disabilities (3 Credits)
Examine and apply empirical research aligned to current trends and areas of investigation in the field of students with significant support needs.
Restriction: Permission of EDUC-Counseling, Higher Education and Special Education department.

EDSP626 Characteristics of Infants and Young Children: Early Childhood Special Education (3 Credits)
Focus on developmental, behavioral, and learning characteristics of infants and young children with and without disabilities.Jointly offered with EDSP420.
Credit Only Granted for: EDSP420 or EDSP6 26.

EDSP627 Curriculum and Instruction: Early Childhood Special Education (3 Credits)
Curriculum and instructor for young children with mild and moderate disabilities, preschool through primary grades.Jointly offered with EDSP422.
Credit Only Granted for: EDSP422 or EDSP6 27.

EDSP631 Early Intervention: Early Childhood Special Education (3 Credits)
Intervention with infants and young children with disabilities. Focus on moderate and severe disabilities.
Restriction: Must be in Special Education (Doctoral) program; or must be in Special Education (Master's) program. Jointly offered with EDSP43 0.
Credit Only Granted for: EDSP430 or EDSP631.

EDSP632 Embracing Diversity: Teaching Students with Disabilities and Gifted Learners in Secondary (3 Credits)
Designed for secondary education majors to prepare for teaching students with disabilities in secondary classrooms. Examines the legal requirements for general education teachers in the public schools including best practices for participating in the Individual Education Program (IEP) team process, and understanding Response to Intervention (RTI) as a approach to the early identification and support of students with learning and behavior needs. Information is provided on the characteristics of students who have been identified as having high incidence disabilities (e.g., learning disabilities, attention deficit hyperactivity disorder, speech and language delays, emotional or behavioral disorders, and other health impairments). Information is also provided on the characteristics of students who are considered gifted and/or talented, as well as instructional methods for differentiating instruction to meet their needs. Also provides information on universal design (UDL) principles for learning, instructional suggestions to include students with disabilities in the general classroom, co-teaching, and methods for integrating technology and assistive technology to benefit all students.
Prerequisite: Permission of instructor.
Restriction: Permission of EDUC-Special Education department.
Credit Only Granted for: EDSP609 or EDSP632.
Formerly: EDSP609.

EDSP652 Curriculum and Instruction: Elementary Special Education (3 Credits)
Methods for instruction of students with disabilities in the general education curriculum. Collaboration with other professionals is included.Jointly offered with EDSP451.
Credit Only Granted for: EDSP451 or EDSP6 52.

EDSP655 Seminar in Secondary and Transition Special Education (3 Credits)
Review of research pertaining to individuals with disabilities in secondary and post-secondary vocational and transitional settings.
Prerequisite: EDSP600.
Restriction: Permission of EDUC-Counseling, Higher Education and Special Education department.

EDSP664 Issues and Models:Secondary/Middle Special Education (3 Credits)
Issues, legislation, and service models in secondary/middle special education. Emphasis on career and vocational education, self-determination, and transition.
Jointly offered with: EDSP466.
Restriction: Permission of EDUC-Counseling, Higher Education and Special Education department.
Credit Only Granted for: EDSP466 or EDSP664.

EDSP665 Families, Culture, and Disability (3 Credits)
Current research on service delivery and cultural factors that influence families of children and youth with disabilities.
Prerequisite: EDSP600.
Restriction: Permission of EDUC-Counseling, Higher Education and Special Education department.

EDSP670 Single Case Research Designs in Education (3 Credits)
Design, application, procedures, and analysis of single case research designs in special education to effectively evaluate instructional decisions.
Prerequisite: EDSP600.
Restriction: Permission of EDUC-Counseling, Higher Education and Special Education department.
Credit Only Granted for: EDSP670 or EDSP870.

EDSP671 Qualitative Methodologies in Special Education (3 Credits)
Design and evaluation of qualitative research in special education across disabilities and ages.
Prerequisite: EDSP600.
Restriction: Permission of EDUC-Counseling, Higher Education and Special Education department.

EDSP673 Evaluating Evidence-Based Practices in Special Education (3 Credits)
Evaluating evidence-based practices in special education, by examining theoretical origins, use of causal designs, programmatic lines of research, and research syntheses to explore the development of what it means for an intervention to have the potential to significantly impact practice.
Prerequisite: EDMS645.
Recommended: EDSP670 and EDSP600.
Credit Only Granted for: EDSP673 or EDSP798E.
Formerly: EDSP798E.

EDSP675 Legal and Policy Foundations for Individuals with Disabilities (3 Credits)
Regulatory and statutory foundations for public policies addressing the education of children and youth with disabilities.
Restriction: Permission of EDUC-Counseling, Higher Education and Special Education department.

EDSP678 Seminar in Special Education (3 Credits)

EDSP682 Advanced Literacy Approaches for At-Risk Adolescents (3 Credits)
Approaches to teaching reading in the content areas for secondary students with disabilities.Jointly offered with EDSP482.
Credit Only Granted for: EDSP482, EDSP488 R, EDSP682, or EDSP788R.
Formerly: EDSP788R.

EDSP683 Assessment and Instruction in Mathematics in Special Education (3 Credits)
Instructional methods and assessment in mathematics in special education.
Restriction: Must be in Special Education (Doctoral) program; or must be in Special Education (Master's) program. Jointly offered with EDSP48 5.
Credit Only Granted for: EDSP485 or EDSP683.

EDSP684 Reading and Writing Instruction in Special Education II (3 Credits)
Development of effective reading and writing programs for students receiving special education services. Builds on the foundation established in EDSP 616.
Prerequisite: EDSP616.
Restriction: Permission of EDUC-Counseling, Higher Education and Special Education department. Jointly offered with EDSP484.
Credit Only Granted for: EDSP484 or EDSP684.

EDSP686 Advanced Studies in Promoting Prosocial Behavior in Special Education (3 Credits)
Focuses on effective practices for social development among students with disabilities. Classroom, school, and community approaches for developing prosocial behavior are covered.
Jointly offered with: EDSP486.
Restriction: Must be in Special Education (Doctoral) program; or must be in Special Education (Master's) program; or permission of EDUC-Counseling, Higher Education and Special Education department.
Credit Only Granted for: EDSP486 or EDSP686.

EDSP687 Collaborative Partnerships in Special Education (3 Credits)
Strategies for positively collaborating with families, practitioners, and community stakeholders to implement Specially Designed Instruction (SDI) for students with disabilities.
Jointly offered with: EDSP487.
Restriction: Must be in Special Education (Doctoral) program; or must be in Special Education (Master's) program.
Credit Only Granted for: EDSP487 or EDSP687.

EDSP690 Teacher Candidate Research Seminar in Special Education (3 Credits)
Required seminar for master's certification teacher candidates in special education focusing on research methods and applications with students having disabilities.
Restriction: Must be in Special Education (Doctoral) program; or must be in Special Education (Master's) program.

EDSP692 Graduate Internship I: Elementary/Middle Special Education (2-4 Credits)
Field experience in elementary/middle school special education.
Restriction: Must be in Special Education (Master's) program.
Credit Only Granted for: EDSP452 or EDSP692.

EDSP695 Graduate Internship II: Elementary/Middle Special Education (6-11 Credits)
Internship II is a full-time 15 week eld-placement experience in a local school system working with students with disabilities in an elementary or middle school environment. Internship II allows the intern to apply and integrate teaching competencies and responsibilities by systematically increasing independence in conducting all aspects of the special education mentor teacher's role. The intern will incrementally assume responsibility for planning, instruction, management, collaboration, and other essential tasks assigned in their internship placement. The intern will be responsible for the successful completion of edTPA, seminar assignments, and self-evaluation using Live Text for Foundational Competencies (FCs) and the Performance Based Assessment (PBA). Interns will be asked to recall and integrate course content from their prerequisite coursework during seminar and their eld placement experience.
Corequisite: EDSP690.
Recommended: Must be in Special Education (Master's) program EDSPM Special Education.
Restriction: Must be in Special Education (Master's) program.
Credit Only Granted for: EDSP495, EDSP695 or EDSP888A.

EDSP788 Selected Topics in Special Education (1-3 Credits)
Current topics and issues in teacher education.
Repeatable to: 6 credits if content differs.

EDSP798 Special Problems in Special Education (1-6 Credits)
Intended for Master's, AGS, or doctoral students in education who desire to pursue a research problem.
Restriction: Permission of EDUC-Counseling, Higher Education and Special Education department.

EDSP799 Master's Thesis Research (1-6 Credits)
Registration required to the extent of six hours for Master's thesis.

EDSP829 Doctoral Capstone (1-12 Credits)
Provides for demonstration of excellence in professional practice in the field of educational leadership. The topic, activities, and outcomes related to the Doctoral Capstone must be approved by the doctoral advisor and capstone committee and presented and defended by the student. The Doctoral Capstone in the Special Education EdD program requires scholars to identify a problem of professional practice in the field of special education. Scholars identify the antecedents, causes and issues related to this problem, subsequently conduct an extensive review of literature, and propose a defendable possible solution for which they provide the rationale.
Prerequisite: Successful completion of mid-program evaluation.
Repeatable to: 12 credits.

EDSP850 Intervention Research in Special Education (3 Credits)
Focuses on the design and implementation of intervention research studies in the field of Special Education. This course will focus on knowledge and skills necessary for (a) evaluating the quality of group and single case design intervention research and related conceptual and methodological issues (e.g., replication, fidelity of implementation), (b) designing and evaluating interventions, (c) implementing interventions in schools, and (d) translating research to practice.
Prerequisite: EDSP860.
Recommended: EDMS646.

EDSP860 Doctoral Research Seminar (3 Credits)
Issues and procedures relevant to conducting and analyzing research in special education.

EDSP870 Advanced Single-Case Research Designs in Special Education (3 Credits)
This advanced single case research methods course is specifically designed for doctoral students in the special education program. This course prepares students to conduct rigorous research using a variety of single case research designs. Students will engage in critical analysis of published single-case research studies and apply their acquired knowledge to the design and implementation of their own single-case research projects.
Restriction: Permission of EDUC-Counseling, Higher Education and Special Education department.
Credit Only Granted for: EDSP670 or EDSP870.

EDSP871 Qualitative Methodology in Special Education (3 Credits)
The purpose of this course is to provide graduate students with an introduction to qualitative inquiry and its application in special education. Students will learn about the different types of qualitative research designs including narrative research, phenomenology, grounded theory, ethnography, and case study, and the philosophical assumptions and interpretive frameworks. Students will learn about the process of designing a qualitative study as well as the process of conducting qualitative research. Students will learn and practice collecting and analyzing qualitative data through an interview and observation. Students will also learn how to establish rigor in qualitative studies; discuss strategies for ensuring quality, credibility and trustworthiness; and practice writing and presenting qualitative research.
Restriction: Permission of EDUC-Counseling, Higher Education and Special Education department.

EDSP872 Theory and Empirical Design in Educational Research (3 Credits)
Design and evaluation of quantitative research in special education across disabilities and ages.
Prerequisite: EDMS645 and EDMS646; or permission of EDUC-Counseling, Higher Education and Special Education department.
Restriction: Must be in Special Education (Doctoral) program.
Credit Only Granted for: EDSP672 or EDSP872.
Formerly: EDSP672.

EDSP875 Policy Issues Affecting Individuals with Disabilities (3 Credits)
An analysis of current educational and disability issues and policies pertaining to children, youth, and adults with disabilities.
Restriction: Permission of instructor; or must be in Special Education (Doctoral) program; or must be in Special Education (Master's) program.

EDSP888 Apprenticeship in Special Education (1-8 Credits)
Apprentice practice under professional supervision in an area of competence compatible with the student's professional goals. Credit not to be granted for experience accrued prior to registration. Open only to degree- and certificate- seeking graduate students.
Restriction: Permission of EDUC-Counseling, Higher Education and Special Education department.

EDSP889 Internship in Special Education (3-8 Credits)
Internship experiences at a professional level of competence in a particular role with appropriate supervision. Credit not to be granted for experience accrued prior to registration. Open only to students advanced to candidacy for doctoral degree.
Restriction: Permission of EDUC-Counseling, Higher Education and Special Education department.

EDSP898 Pre-Candidacy Research (1-8 Credits)

EDSP899 Doctoral Dissertation Research (1-8 Credits)
Registration required to the extent of 6-9 hours for an Ed.D. Project and 12-18 hours for a Ph.D. dissertation.

EDUC - Education

EDUC401 International and Multicultural Perspectives in Education (3 Credits)
Comparison of historical changes and current challenges, and how culture, diversity and tolerance in the US and Netherlands impacts education systems. Experiential visits to historical sites, educational institutions and notable landmarks, with a critical reflection on similarities, differences and intersections of culture, diversity, tolerance and change.
Restriction: By permission of the College of Education and the Education Abroad Office .
Credit Only Granted for: EDUC498I or EDUC401.
Formerly: EDUC498I.
Additional Information: This is a 3-week living-learning study abroad experience in the Netherlands, Germany and Belgium. The course is offered through the Education Abroad office. Prospective students must complete the MYEA application. Myea.umd.edu.

EDUC478 Using Information Technology in Schools (1-3 Credits)
Strategies, resources, tools and organizational concepts for using technology to facilitate classroom learning and school administrative functions.
Restriction: Permission of EDUC-College of Education; and junior standing or higher.
Repeatable to: 6 credits if content differs.

EDUC498 Selected Topics in Education (1-3 Credits)
Current topics and issues in education.
Restriction: Permission of EDUC-College of Education.
Repeatable to: 9 credits if content differs.

EDUC499 Honors Thesis (1-6 Credits)
Individual thesis work under supervision of faculty advisors; includes periodic seminar meetings with other honors students engaged in thesis work.
Prerequisite: Admission to College Honors Program.
Restriction: Permission of EDUC-College of Education.

EDUC640 Introduction to Educational Leadership (3 Credits)
The focus of this course is the analysis of the role of education administrators/leaders in the social, political, and legal contexts of schools. Also examines the role of leadership in school improvement.
Credit Only Granted for: EDHI640 or EDUC640.
Formerly: EDHI640.

EDUC645 Leading Instructional Improvement (3 Credits)
Development of knowledge and skills in the use of data bases, research findings and models of supervision, to improve instruction in schools.
Credit Only Granted for: EDHI645 or EDUC645.
Formerly: EDHI645.

EDUC646 Leading Instructional Excellence (3 Credits)
Leader's role in fostering high quality teaching and learning. Exploration of the relationship between curriculum instruction assessment and the organizational structure of K-12 public schooling. Development and assessment of frameworks for understanding instructional quality. Analysis of strategies for supporting teachers as they engage in curricular and professional development. Consideration of factors involved in creating and sustaining instructionally centered schools.
Prerequisite: EDUC645; or permission of instructor.
Credit Only Granted for: EDHI646 or EDUC646.
Formerly: EDHI646.

EDUC670 Learning Communities (3 Credits)
Reviews contemporary research on student and teacher learning and schools as learning organizations. It aims to build students understanding of opportunities and challanges to implementing learning environments in various educational organizations. Readings, cases and assignments emphasize students' understanding of learning theories and their application to various organizational settings.
Credit Only Granted for: EDHI670 or EDUC670.
Formerly: EDHI670.

EDUC671 Education Law, Finance and Policy (3 Credits)
An examination of the way judicial interpretation of common, statutory, and constitutional law shapes and constrains educational policy making. In addition, this course is designed to introduce students to issues related to the financing and resource management of public elementary and secondary schools and school systems in the United States. All discussions include dimensions of both theory and practice and specifically address reform in terms of alternatives to current practice.

EDUC689 Practicum In Educational Administration and Supervision (1-3 Credits)
Promotes skill development in managerial, leadership and supervisory areas. Practicum is based on results of diagnostic instruments and an individual professional development plan.
Repeatable to: 3 credits if content differs.

EDUC698 Advanced Topics in Education (1-3 Credits)
Arranged study on specific topics in education.
Restriction: Permission of EDUC-College of Education.
Repeatable to: 6 credits if content differs.

EDUC701 Applied Research and Data Based Decision Making for School Leaders (3 Credits)
This course focuses on understanding school system data including student assessments, teacher and administrator evaluations and other program data. Ed.D. students will learn to evaluate the technical characteristics and implications for use of such data as well as how to design instruments to collect needed data.
Restriction: Permission of EDUC-College of Education.
Credit Only Granted for: EDUC701 or EDHI701.
Formerly: EDHI701.

EDUC702 Applied Research Design for Education Leaders (3 Credits)
Emphasizes quantitative and qualitative methodologies to investigate a range of educational problems. Designed for EdD doctoral students.
Restriction: Permission of EDUC-College of Education.
Credit Only Granted for: EDUC702 or EDHI702.
Formerly: EDHI 702.

EDUC703 Conducting Library Research for Capstones (2 Credits)
Course is designed to provide students in the Ed.D. doctoral program in School System Leadership with the skills necessary to conduct library research in preparation for developing the literature review for the Capstone.
Restriction: Permission of EDUC-College of Education; and must be enrolled in EdD in School System Leadership.

EDUC704 Introduction to Writing for Education Leaders (2 Credits)
This course is designed to provide students in the Ed.D. program with specific strategies and skills needed to complete their Dissertation of Practice. Skills include constructing a problem statement and developing a cohesive argument for a proposed solution.
Restriction: Permission of EDUC-College of Education and Must be in EdD School System Leadership program.

EDUC705 Education Policy Making and the School Leader (4 Credits)
Course analyzes educational K-12 policies and their impacts on school systems and the leadership of those systems
Restriction: Permission of EDUC-College of Education.
Credit Only Granted for: EDUC705 or EDPL663.
Formerly: EDPL663.

EDUC740 Managing Educational Organizations in a Diverse Society (4 Credits)
Contemporary social and cultural influences that impact on the management of schools and school systems in a diverse society. The effects on schools and school systems of changes in the economy, family structure, demographics and technology will be examined.
Restriction: Permission of EDUC-College of Education.
Credit Only Granted for: EDUC740 or EDHI740.
Formerly: EDHI740.

EDUC747 Advanced Seminar on Instructional Improvement for School Leaders (4 Credits)
Course addresses current issues, research, trends, and problems in the areas of instructional improvement and the responsibilities of school-based administrators in improving student learning.
Restriction: Permission of EDUC-College of Education.
Credit Only Granted for: EDUC747 or EDHI747.
Formerly: EDHI747.

EDUC760 The Human Dimension in Administration (4 Credits)
Course focuses on theory, research findings, and current practices in managing human resources in educational organizations. Issues related to performance evaluations, professional development, and legal and ethical standards are addressed.
Restriction: Permission of EDUC-College of Education.
Credit Only Granted for: EDUC760 or EDHI760.
Formerly: EDHI760.

EDUC767 Seminar on School District Leadership (4 Credits)
Examination of theory and research related to school district leadership with focus on improvement sciences. Course uses improvement science model to understand organizational, political, community, instructional problems of practice.
Restriction: Permission of EDUC-College of Education.
Credit Only Granted for: EDUC767 or EDHI767.
Formerly: EDHI767.

EDUC770 System Innovation and Transformation (4 Credits)
Course is designed to provide EdD students understanding how complex systems improve performance and connect educational and social objectives to goals of innovation and efficiency.
Restriction: Permission of EDUC-College of Education.
Credit Only Granted for: EDUC769, EDHI788M, or EDUC770.
Formerly: EDHI788M.

EDUC773 Seminar in School Finance and Resource Management (4 Credits)
Issues related to financing and resource management in US K-12 public education systems will be investigated including how various levels of government support public education, and the revenue-generating tools they use. A major theme throughout the course will be on how the values and concepts of educational equity drive the distribution of revenue to schools and how to use data to create . a school-level resourcing plan that provides access and opportunities to learning for every student.
Prerequisite: Permission of instructor.
Restriction: Must be in the Ed.D. School System Leadership program.

EDUC828 Mid-Program Evaluation Portfolio (2-6 Credits)
Students will examine issues of performance assessment and develop a professional portfolio that follow NELP standards and assessment criteria and will compile and synthesize research/inquiry and experiential learning and reflections that demonstrate mastery of the standards.
Restriction: Permission of instructor and Must be in Ed.D. in School Leadership program.
Repeatable to: 12 credits.

EDUC829 Doctoral Capstone (1-6 Credits)
The completion of a doctoral capstone is required for all professional practice doctoral students, allowing demonstration of excellence in professional practice in the field of education leadership. The topic, activities, and outcomes related to the doctoral capstone must be approved by the doctoral advisor and capstone committee and presented and defended by the student.
Prerequisite: EDUC828.
Restriction: Successful completion of mid-program evaluation.
Repeatable to: 12 credits.

EDUC888 Applied Apprenticeship in Education (1-3 Credits)
Apprentice practice under professional supervision in an area of competence compatible with the student's professional goals.
Restriction: Permission of EDUC-College of Education.
Repeatable to: 12 credits.

EDUC898 Pre-Candidacy Research (2-4 Credits)
Pre-Candidacy Research
Repeatable to: 12 credits.

EDUC899 Dissertation of Practice Research (1-6 Credits)
Registration required to the extent of 6-9 hours for an Ed.D. Dissertation.
Repeatable to: 9 credits.

EMBA - Executive MBA Program

EMBA610 Introduction to Financial Accounting (2 Credits)
Overview of financial accounting, periodic financial statements and the financial reporting process. Importance of financial statements as information source for creditors and investors and as a means by which managers can communicate information about their firms.
Restriction: Must be in Executive MBA program.

EMBA611 Managerial Accounting (2 Credits)
Use of accounting data in corporate planning and control. Cost-volume-profit analysis, budgeting, pricing decisions and cost data, transfer pricing, activity-based management, performance measures, and standard costing.
Restriction: Must be in Executive MBA program.

EMBA616 Accounting for Senior Management (3 Credits)
This course is designed to give senior managers an overview of basic financial and managerial accounting principles and tools with emphasis on those principles and tools they can use to support various managerial decision-making tasks.
Restriction: Must be in Executive MBA program.

EMBA617 Accounting for Decision Making (4 Credits)
An overview of financial accounting including the emphasis on periodic financial statements, the financial reporting process, the importance of financial statements as (i) an information source for creditors and investors and (ii) a means by which managers can communicate information about their firms. Overview of managerial accounting in corporate planning and control. Specific facets include cost-volume-profit analysis, budgeting, pricing decisions and cost data, transfer pricing, activity-based management, performance measures, and standard costing.
Restriction: Must be in Executive MBA program.

EMBA620 Strategic Information Systems (2 Credits)
Use of information technology to achieve competitive advantage, efficient operations, and effective decision making. Analysis of functions of information technology and its impact on competitive strategy and organizational operations.
Restriction: Must be in Executive MBA program.

EMBA621 Digital Transformation in Business (3 Credits)
Introduces students to the strategic role of digital transformation within businesses, and provides an overview for how major information technologies may be used to inform and transform the firm's strategic, operational, and tactical decisions. Topics discussed in the course include the strategic use of digital technologies to generate sustainable competitive value; the contributions of new forms of technology infrastructure; the evaluation of new technology investments and the resulting ROI; acquiring, managing and governing technological capabilities within the firm; understanding the role of enterprise systems and social technologies within the firm; and the management of disruptive technologies within and outside the firm.
Restriction: Must be in Executive MBA program.

EMBA630 Data Models and Decisions (3 Credits)
To develop probabilistic and statistical concepts, methods and models through examples motivated by real-life data from business and to stress the role that statistics play in the managerial decision making process.
Restriction: Must be in Executive MBA program.

EMBA637 Corporate Finance (4 Credits)
Presents key concepts in corporate finance as well as tools used in making corporate financial decisions. Topics include valuation of corporate securities, capital investment decision making, capital market theory, operation and efficiency of financial markets, corporate financing decisions, and risk management.
Restriction: Must be in Executive MBA program.

EMBA640 Financial Management (3 Credits)
Analysis of major corporate financial decisions using a market-oriented framework. Topics include capital budgeting, security portfolio theory, operation and efficiency of financial markets, options pricing, financing decisions, capital structure, payout policy and international finance.
Restriction: Must be in Executive MBA program.

EMBA647 Economics and Public Policy (4 Credits)
Introduction to the economic concepts essential to business decision-making. Concepts covered include supply, demand, cost pricing, competition, monopoly, non-competitive markets, game theory, vertical integration, regulation, national income accounting, fiscal policy, monetary policy, balance of payments accounting, exchange rates and international economics. Primary attention is given to cases.
Restriction: Must be in Executive MBA program.

EMBA650 Marketing Management (2 Credits)
Analysis of marketing problems and evaluation of specific marketing efforts regarding the organization's products and services, pricing activities, channel selection, and promotion strategies in both domestic and international markets.
Restriction: Must be in Executive MBA program.

EMBA654 Organizational Change (1-3 Credits)
This course is designed to assist you in developing the skills necessary to successfully manage change in a turbulent environment. As part of the course design, an overview of organizational change management strategies aimed at improving the organization's ability to cope with change will be covered. In addition, the course provides students with the models for understanding the dynamics of organizational change. Change management skills are among the most important skills that any professional can possess.
Restriction: Must be in Executive MBA program.

EMBA656 Leadership and Human Capital (3 Credits)
The overall objective of this course is to sensitize participants to the fact that managers face many dilemmas (such as the need to maintain control, yet be flexible enough to effectively change as the competitive environment requires); and therefore, managers need to have skills that will enable them to effectively manage and lead, and thus to become leader-managers. How managing versus leading-skills differ will be emphasized in this course. To raise participants' sensitivity to managerial dilemmas and the skills needed to effectively manage these, there will be extensive use of case discussions and video-clips about challenges faced by companies and their managers, and extensive opportunities for self-reflective and experiential exercises. The development of action-plans for implementing a desirable change in participants' current job-situation will also help participants to hone the skills needed to be effective change-agents, hence leaders, in their organization.
Restriction: Must be in Executive MBA program.

EMBA662 Leadership and Teamwork (2 Credits)
Course examines concepts of team-building and leadership which are critical to managerial success. Topics include leadership, decision-making, communication and conflict, work motivation, building effective teams, and organizational change and culture.
Restriction: Must be in Executive MBA program.

EMBA663 Managing Human Capital (2 Credits)
Course examines core human resource management principles and emphasizes skills for maximizing an organization's human capital. Topics include recruitment, selection, performance feedback and incentives, termination of poor performers, and managing organizational change through human resource systems and policies.
Restriction: Must be in Executive MBA program.

EMBA664 IT Transformation of Organizations, Industries and Markets (2 Credits)
Information technology enables the transformation of organizations, industries and markets. The purpose of this course is to understand the forces within organizations and industries that combine with the technology to create these transformations. The course focuses on general models of transformation as well as case studies of specific organizations and industries. Teams of students will select an industry and prepare a report on how technology is now or will transform it, and examine the implications for how businesses will function in the future.
Restriction: Must be in Executive MBA program.

EMBA674 Marketing Simulation (2 Credits)
This is a capstone marketing course that is taught primarily through the simulation MARKSTRAT. As we go through the simulation we will discuss marketing strategies designed to manage products in selected market segments. Topics covered include competitor analysis, buyer analysis, market segments, and product strengths and weaknesses; product related issues are identified and marketing strategies developed, assessed and implemented. The material is then complemented with the MARKSTRAT simulation. The prerequisite for this course is Marketing Management or Marketing Strategy.
Prerequisite: Must have completed Marketing Management or Marketing Strategy coursework.
Restriction: Must be in Executive MBA program.

EMBA678 Ethical Leadership (1-3 Credits)
This course will explore the following topics; Recognize the scope of managerial agency and the economic, legal and ethical responsibilities to various stakeholders, Conduct elementary ethical analyses of managerial situations using the principal schools of ethical reasoning, Identify the economic and ethical properties of a market mechanism, and the means for addressing the limitations of a market, and Recognize ethical leadership as the exercise of managerial agency in changing existing values and practices.
Restriction: Must be in Executive MBA program.
Repeatable to: 3 credits if content differs.

EMBA681 Managerial Economics and Public Policy (2 Credits)
Basic microeconomic principles used by firms, including supply and demand, elasticities, costs, productivity, pricing, marketing structure and competitive implications of alternative market structures. Market failures and government intervention. Public policy processes affecting business operations.
Restriction: Must be in Executive MBA program.

EMBA683 The Global Economic Environment (2 Credits)
Relationship between national and international economic environments. Determinants of output, interest rates, prices and exchange rates. Analysis of effect of economic policies (fiscal, monetary, trade, tax) on the firm and the economy.
Restriction: Must be in Executive MBA program.

EMBA688 Strategic Management (1 Credit)
This course aims to give you the tools, frameworks, and ideas necessary to develop business units and corporate strategies for your oraganizations that fit, both in the short run and long run. As noted above, this requires that we appreciate how best to analyze and identify profit opportunities and threats in different industies and competitive environments; how best to analyze and identify your organization's valuable assets, resources and capabilities and how they might be protected, leveraged, and extended inthe market; how to organize your firm to be best prepared to adapt its strategy over time as the market environment changes; how to use organic growth as well as mergers, acquisitions, joint ventures, alliances, and divestitures to ensure that your organization around its strategy to maximize the probability of successful strategy implementation.
Restriction: Must be in Executive MBA program.
Repeatable to: 3 credits if content differs.

EMBA690 Strategic Management (2 Credits)
Integrative strategic management focusing on strategy formulation and implementation in domestic and global settings. Industry and competitor analysis, industry and firm value chain, leadership, goal setting, organizational structure and culture. Case study approach to top management and organizational problems.
Restriction: Must be in Executive MBA program.

EMBA693 Supply Chain (2 Credits)
The age of the real-time supply chain has finally arrived. Companies can now connect instantaneously with suppliers, distributors, manufacturers, customers, and alliance partners around the world. On-line access to up-to-the minute information enables companies to improve communication and project management across the entire supply chain, promote collaboration across departments, and enhance customer service and financial operations. The results are stunning; for example, a recent survey reports dramatic increases in revenues and customer retention and decreases in operating costs and product cycle times. As competition heats up from every direction, the ability to design and manage your supply chain with precision and speed becomes a business imperative. This course offers a practical blueprint for building, implementing, and sustaining supply chains in today's rapidly changing environment.
Restriction: Must be in Executive MBA program.

EMBA694 Operations Management (2 Credits)
A firm has the opportunity to create competitive advantage through proficient management of its operations. To do so, the firm must first recognize and establish the strategic role of its operations within the organization. Then, at the more detailed operational level, the firm must execute effectively and efficiently. This course examines the strategic role that the operations function can play, and offers specific tools and techniques that the firm can use for strategy execution. We cover concepts of operations managment applied to both manufacturing and services, including operations strategy, analysis of process flows and bottlenecks, waiting line models, total quality management, six sigma, and revenue management.
Restriction: Must be in Executive MBA program.

EMBA711 Financial Planning and Control Systems (2 Credits)
The role accounting plays in planning and controlling issues within organizations. It takes a high-level view of planning and control and will encourage you to take a very broad view of the topic.
Restriction: Must be in Executive MBA program.

EMBA724 International Financial Management (3 Credits)
The role of financial management in the multinational firm. The financing and managing of foreign investments, assets, currencies, imports and exports. National and international financial institutions and markets.
Prerequisite: EMBA640.
Restriction: Must be in Executive MBA program.

EMBA757 Marketing Strategy (3 Credits)
A capstone marketing course. Marketing strategies designed to manage products in selected market segments. Topics covered include competitor analysis, buyer analysis, market segments, and product strengths and weaknesses; product related issues are identified and marketing strategies developed, assessed and implemented.
Restriction: Must be in Executive MBA program.

EMBA758 Special Topics (2-3 Credits)
Selected advanced topics in the various fields of graduate study in business.
Restriction: Must be in Executive MBA program.
Repeatable to: 12 credits if content differs.

EMBA759 Independent Study (1-6 Credits)
Independent study for Masters students in Business.
Restriction: Must be in Executive MBA program.
Repeatable to: 12 credits if content differs.

EMBA778 Special Topics (2-3 Credits)
Selected advanced topics in the various fields of graduate study in business.

EMBA788 Executive Skills Mastery (1-2 Credits)
This course is designed to focus on the development of the specific set of skills that executives need to successfully perform in today's organizational environment. Students complete assessments which help to target their specific skill level and in the aggregate give instructors clear ideas on the needs of the cohort. The assessments also augment executive coaching, when provided. This is typically registered as a one credit course except when a particular program's cirriculum allocates enough contact hours to all course topics to be covered at a more advanced level.
Repeatable to: 12 credits if content differs.
Formerly: BMGT788A.

EMBA789 Leadership Mastery (1-2 Credits)
This course addresses organizational challenges from the CEO or C-level perspective. At this level, the ability to engage ambiguity and chaos effectively is essential. Creating strategy while using a systems approach and understanding how each functional area interacts with the other (with both the short-term and long-term in mind) are of very high importance. The course covers topics that consume the days of senior level leaders in organizations. This is typically registered as a one credit course except when a particular program's cirriculum allocates enough contact hours to all course topics to be covered at a more advanced level.
Repeatable to: 12 credits if content differs.
Formerly: BMGT788B.

EMBA798 Action Learning Project (1-2 Credits)
This course is designed to give the student the opportunity to work on a real-time, salient business challenge or issue for the sponsoring organization. This is often the student's employer. Students are encouraged to design projects which extend beyond a single functional area and require them to examine the interaction of multiple functional areas from a systems perspective. Students work in teams for the projects. This allows them to learn from one another, as well as to learn how to work more effectively in teams - especially in a largely virtual environment. This is typically a two credit course when projects are initiated and completed entirely within a single term. It may be a one credit course when projects extend over more than one term.
Repeatable to: 9 credits if content differs.

ENAE - Engineering, Aerospace

ENAE403 Aircraft Flight Dynamics (3 Credits)
Study of motion of aircraft, equations of motion, aerodynamic force representation, longitudinal and lateral motions, response to controls and to atmospheric disturbances, handling qualities criteria and other figures of merit.
Prerequisite: ENAE414 and ENAE432.
Restriction: Must be in Engineering: Aerospace program; or permission of ENGR-Aerospace Engineering department.

ENAE404 Space Flight Dynamics (3 Credits)
Three-dimensional motion under central fields. Solutions to orbital motion, orbital elements, time elements. Kepler's laws. Orbital maneuvering, rendezvous and station-keeping. Rigid-body attitude dynamics, spacecraft attitude dynamics.
Prerequisite: ENAE301.
Restriction: Must be in Engineering: Aerospace program; or permission of ENGR-Aerospace Engineering department.

ENAE410 Compressible Aerodynamics (3 Credits)
Second course of a two-course sequence in fluid mechanics for aerospace engineers. Topics covered include basic equations of compressible flow, definitions of compressibility, shock waves, expansion waves, flows through nozzles and diffusers, subsonic flow over airfoils, linearized supersonic flow over airfoils, basic equations of viscous flow, internal flow, boundary layers, introduction to turbulence.
Prerequisite: Minimum grade of C- in ENES232, MATH241, and ENAE310.
Restriction: Must be in Engineering: Aerospace program; or permission of ENGR-Aerospace Engineering department; and junior standing or higher.
Credit Only Granted for: ENAE410 or ENAE311.
Formerly: ENAE311.

ENAE414 Incompressible Aerodynamics (3 Credits)
Aerodynamics of inviscid incompressible flows. Aerodynamic forces and moments. Fluid statics/buoyancy force. Vorticity, circulation, the stream function and the velocity potential. Bernoulli's and Laplace's equations. Flows in low speed wind tunnels and airspeed measurement. Potential flows involving sources and sinks, doublets, and vortices. Development of the theory of airfoils and wings.
Prerequisite: PHYS271, (MATH240 or MATH461), PHYS270, MATH246, ENAE283, ENES220, ENAE202, MATH241, and ENES232.
Restriction: Must be in Engineering: Aerospace program; or permission of ENGR-Aerospace Engineering department; and junior standing or higher.
Credit Only Granted for: ENAE310 or ENAE414.

ENAE420 Computational Structural Mechanics (3 Credits)
Introductory of finite element methods for aerospace engineering modeling and analysis; equips students with ability to understand manuals of commercial finite element analysis software.
Prerequisite: ENES220 and MATH241; and must have completed a course in linear algebra.
Restriction: Must be in Engineering: Aerospace program; or permission of ENGR-Aerospace Engineering department.

ENAE423 Vibration and Aeroelasticity (3 Credits)
Dynamic response of single and multiple degrees of freedom systems, finite element modeling, wing divergence, aileron reversal, wing and panel flutter.
Prerequisite: ENAE324.
Restriction: Must be in Engineering: Aerospace program; or permission of ENGR-Aerospace Engineering department.

ENAE425 Mechanics of Composite Structures (3 Credits)
Introduction to structures composed of composite materials and their applications in aerospace. In particular, filamentary composite materials are studied. Material types and fabrication techniques, material properties, micromechanics, anisotropic elasticity, introduction to failure concepts.
Prerequisite: MATH246, ENAE324, ENES220, and MATH241.

ENAE432 Control of Aerospace Systems (3 Credits)
An introduction to the feedback control of dynamic systems. Laplace transforms and transfer function techniques; frequency response and Bode diagrams. Stability analysis via root locus and Nyquist techniques. Performance specifications in time and frequency domains, and design of compensation strategies to meet performance goals.
Prerequisite: Minimum grade of C- in ENAE301 and ENAE283.
Restriction: Junior standing or higher; and must be in Engineering: Aerospace program.

ENAE441 Space Navigation and Guidance (3 Credits)
Principles of navigation. Celestial, radio, and inertial navigation schemes. Navigational and guidance requirements for orbital, planetary, and atmospheric entry missions. Fundamentals of estimation theory, linear and nonlinear filtering techniques.
Prerequisite: Minimum grade of C- or better in ENAE432; and must have completed or be concurrently enrolled in ENAE404.
Restriction: Must be in Engineering: Aerospace program; or permission of ENGR-Aerospace Engineering department.

ENAE450 Robotics Programming (3 Credits)
Introduces students to the Robot Operating System (ROS) as well as to many of the available tools commonly used in robotics. Lectures focus on theory and structure, whereas laboratory sections will focus on applications and implementations. Students learn how to create software and simulations, interface to sensors and actuators, and integrate control algorithms. The course works through exercises involving a number of autonomous robots (i.e., ground and air vehicles) that students will eventually use in their subsequent RAS minor courses. Topics include: ROS architecture, console commands, ROS packages, simulation environments, visualizations, autonomous navigation, manipulation, and robot vision.
Prerequisite: ENME480 or ENAE380.
Restriction: Must be in the Robotics and Autonomous Systems (RAS) minor; or permission of department.
Additional Information: Students in the Robotics and Autonomous Systems minor should take ENME480 as a prerequisite; Aerospace Engineering students not in the minor should take ENAE380.

ENAE455 Aircraft Propulsion and Power (3 Credits)
Thermodynamic cycle analysis, aerothermochemistry of fuels and propellants, operating principles of piston, turbojet, fanjet, and other variations of airbreathing aircraft power units.
Prerequisite: ENES232, ENAE414, and ENAE311.
Restriction: Must be in Engineering: Aerospace program; or permission of ENGR-Aerospace Engineering department.

ENAE457 Space Propulsion and Power (3 Credits)
Thermodynamic cycle analysis, aerothermochemistry of fuels and propellants, operating principles of rocket, ion, and other exoatmospheric power units.
Prerequisite: PHYS271, ENES232, PHYS270, and ENAE311.
Restriction: Must be in Engineering: Aerospace program; or permission of ENGR-Aerospace Engineering department. And senior standing.

ENAE464 Aerospace Engineering Laboratory (3 Credits)
Application of fundamental measuring techniques to measurements in aerospace engineering. Includes experiments in aerodynamics, structures, propulsion, flight dynamics and astrodynamics. Correlation of theory with experimental results.
Prerequisite: ENAE324, ENAE362, ENAE311, and ENAE432.
Restriction: Must be in Engineering: Aerospace program; or permission of ENGR-Aerospace Engineering department.
Credit Only Granted for: ENAE464 or ENAE364.

ENAE467 Advanced Space Propulsion and Power (3 Credits)
Charged particle motion, drift mechanisms, plasma sheaths, creation of plasmas. Representative electrothermal, electrostatic, and electromagnetic propulsion technologies. Power production and direct-drive thrust generation using fusion as time permits.
Prerequisite: ENAE457.
Jointly offered with: ENAE667.
Restriction: Permission of Instructor.
Credit Only Granted for: ENAE488I, ENAE467, or ENAE667.
Formerly: ENAE488I.

ENAE471 Aircraft Flight Testing (3 Credits)
Provides basic instruction to aircraft flight testing and demonstrates need for systematic, well-proven technique to allow for accurate airplane performance. Concepts of aerodynamics, airplane performance, and stability and control. Emphasis on single-engine general aviation type aircraft.
Prerequisite: ENAE414.
Corequisite: ENAE403.
Restriction: Must be in Engineering: Aerospace program.

ENAE472 Introduction to Hypersonics (3 Credits)
Introduces students to the various key aspects of flight at hypersonic speeds. Critical aerodynamic phenomena to be covered includes the qualitative behavior of flow fields in the high-Mach-numberlimit, approximate methods for quantifying surface pressure, and estimates of viscous drag and heating. High-speed air-breathing propulsion systems will be discussed, including cycle analysis and performance metrics for propulsion, with a main emphasis onthe fundamentals of ramjet and scramjet engines. Key Guidance, Navigation and Control (GNC) concepts for various hypersonic vehicle types will also be introduced, including the design of appropriate flight trajectories and control algorithms to achieve mission goals. Finally, students will be provided with an overview of high-temperature materials, structures, and thermal protection systems.
Prerequisite: ENAE311 or enrolled in hypersonics graduate certificate program.
Corequisite: ENAE481 or ENAE483 (if not enrolled in hypersonics graduate certificate program).
Restriction: Students must be in the Hypersonic Graduate Certificate Program (code: Z165) or receive permission from the department.
Credit Only Granted for: ENAE488N or ENAE472.
Formerly: ENAE488N.

ENAE480 Fundamentals of Aerospace Design (2 Credits)
Principles of aerospace systems analysis and design. Vehicle performance analysis and optimization. Introduction to systems analysis and design, including design optimization and trade studies, sensitivity analysis, mass and cost estimation, multivariate design optimization, and risk analysis. Aerospace human physiology and impact on the design process. Design of vehicle systems including avionics, power, propulsion, life support, human factors, structures, actuator and mechanisms, and thermal control.
Prerequisite: Minimum grade of C- in ENAE301, ENAE310, ENAE325, and ENAE362; and must have completed or be concurrently enrolled in ENAE491 or ENAE493.
Restriction: Must be in Engineering: Aerospace program; or permission of ENGR-Aerospace Engineering department.

ENAE481 Principles of Aircraft Design (3 Credits)
Aircraft design principles blending both synthesis and analysis. The iterative nature of the design process. Applied aerodynamics. Elements of aircraft performance calculation and optimization. Design of aircraft including payload, crew and avionics provisions, propulsion selection and sizing, aerodynamic configuration optimization, mass properties, stability and control characteristics, and vehicle subsystems. Individual student projects in aircraft design.
Prerequisite: ENAE324, ENAE362, and ENAE432.
Corequisite: ENAE414.
Restriction: Must be in Engineering: Aerospace program; or permission of ENGR-Aerospace Engineering department.
Credit Only Granted for: ENAE481 or ENAE491.

ENAE482 Aeronautical Systems Design (3 Credits)
Senior capstone design course in the aeronautics track. Introduction of computerized methods for sizing and performance analysis. More comprehensive methods to predict weight, aerodynamics and propulsion system characteristics. Consideration in design disciplines such as vulnerability, maintainability, produceability, etc. Groups of students will complete, brief and report on a major design study to specific requirements.
Prerequisite: ENAE455, ENAE423, ENAE403, and ENAE481.
Restriction: Must be in Engineering: Aerospace program; and senior standing or higher.

ENAE483 Principles of Space Systems Design (3 Credits)
Principles of space systems analysis and vehicle design. Launch vehicle performance analysis and optimization. Design of vehicle systems including avionics, power, propulsion, life support, human factors, structures, actuator and mechanisms, and thermal control. Design processes and design synthesis. Individual student projects in vehicle design.
Prerequisite: ENAE404, ENAE324, ENAE362, and ENAE432.
Restriction: Must be in Engineering: Aerospace program; or permission of ENGR-Aerospace Engineering department.
Credit Only Granted for: ENAE483 or ENAE493.

ENAE484 Space Systems Design (3 Credits)
Senior capstone design course in the space track. Group preliminary design of a space system, including system and subsystem design, configuration control, costing, risk analysis, and programmatic development. Course also emphasizes written and oral engineering communications.
Prerequisite: ENAE423, ENAE483, ENAE441, and ENAE457.
Restriction: Must be in Engineering: Aerospace program.

ENAE488 Topics in Aerospace Engineering (1-4 Credits)
Technical elective taken with the permission of the student's advisor and instructor. Lecture and conference courses designed to extend the student's understanding of aerospace engineering. Current topics are emphasized.
Prerequisite: Permission of student's advisor required.
Restriction: Permission of instructor.

ENAE491 Principles of Aircraft Design (2 Credits)
Companion course to ENAE480, focusing on topics specific to aeronautical systems, and starting the team design exercise to be continued in ENAE492 in the Spring. Aircraft design principles blending both synthesis and analysis. Applied aerodynamics, elements of aircraft performance calculation and optimization. Design of aircraft including payload, crew and avionics provisions, propulsion selection and sizing, aerodynamic configuration optimization, mass properties, stability and control characteristics, and vehicle subsystems.
Prerequisite: Minimum grade of C- in ENAE325; and must have completed or be concurrently enrolled in ENAE403, ENAE455, and ENAE480.
Restriction: Must be in Engineering: Aerospace program; or permission of ENGR-Aerospace Engineering department.
Credit Only Granted for: ENAE481 or ENAE491.

ENAE492 Aeronautical Systems Design (3 Credits)
Senior capstone design course in the aeronautics track. Introduction of computerized methods for sizing and performance analysis. More comprehensive methods to predict weight, aerodynamics and propulsion system characteristics. Consideration in design disciplines such as vulnerability, maintainability, produceability, etc. Groups of students will complete, brief and report on a major design study to specific requirements.
Prerequisite: ENAE403, ENAE423, ENAE455, and ENAE491.
Restriction: Must be in Engineering: Aerospace program; and senior standing or higher.
Credit Only Granted for: ENAE482 or ENAE492.
Formerly: ENAE482.

ENAE493 Principles of Space Systems Design (2 Credits)
Companion course to ENAE480, focusing on topics specific to space systems, and starting the team design exercise to be continued in ENAE494. Space systems design principles, including design of life support systems, spacecraft internal layout for habitability and functionality, airlock design and extravehicular activity, interplanetary and planetary surface navigation, communications link budgets, structural margins of safety calculations, design of spacecraft power generation and energy storage, propulsion system design including reaction control systems, and spacecraft thermal control system design and analysis.
Prerequisite: Minimum grade of C- in ENAE325; and must have completed or be concurrently enrolled in ENAE404, ENAE457, and ENAE480.
Restriction: Must be in Engineering: Aerospace program; or permission of ENGR-Aerospace Engineering department.
Credit Only Granted for: ENAE483 or ENAE493.

ENAE494 Space Systems Design (3 Credits)
Senior capstone design course in the space track. Group preliminary design of a space system, including system and subsystem design, configuration control, costing, risk analysis, and programmatic development. Course also emphasizes written and oral engineering communications.
Prerequisite: ENAE404, ENAE423, ENAE457, and ENAE493 .
Restriction: Must be in Engineering: Aerospace program; and senior standing or higher.
Credit Only Granted for: ENAE484 or ENAE494.
Formerly: ENAE484.

ENAE499 Elective Research (3 Credits)
Undergraduate research project and paper conducted under the direction of an aerospace engineering faculty member to be presented at a conference or competition.
Prerequisite: Permission from student's advisor required.
Restriction: Senior standing or higher; and must be in Engineering: Aerospace program; and permission of instructor; and permission of ENGR-Aerospace Engineering department.
Repeatable to: 6 credits if content differs.

ENAE601 Astrodynamics (3 Credits)
Mathematics and applications of orbit theory, building upon the foundations developed in ENAE 404 and ENAE 441. Topics include two body orbits, solutions of Kepler's equation, the two-point boundary value problem, rendezvous techniques, and Encke's method.
Prerequisite: ENAE404; or permission of ENGR-Aerospace Engineering department.

ENAE602 Spacecraft Attitude Dynamics and Control (3 Credits)
Rigid body rotational dynamics of spacecraft; forced and unforced motion, torques produced by the orbital environment; orbit/attitude coupling; gas jet, momentum wheel, and magnetic torque actuators. Elementary feedback attitude regulators and algorithms for linear and nonlinear attitude tracking.
Prerequisite: ENAE404 and ENAE432.

ENAE603 Near-Earth Object Exploration (3 Credits)
An overview of the near-Earth objects (NEOs) of our solar system--the asteroids and comets whose orbits closely approach Earth's orbit--and what we know about them, what we're learning about them, and how to design spacecraft missions to interact with them.
Prerequisite: ENAE601.
Restriction: Must be in one of the following programs (ENGR: MS/PhD-Aerospace Engineering (Master's); ENGR: MS/PhD-Aerospace Engineering (Doctoral)).
Credit Only Granted for: ENAE788N or ENAE603.
Formerly: ENAE788N.

ENAE604 Applied Estimation of Dynamic Systems (3 Credits)
Estimation problems for dynamic systems in application; though the Kalman filter is analytically solvable for linear systems with normal distributions, beyond that, approximations must be made. The course is application-oriented and looks at different approximations and their suitability for different applications. During the latter half of the course particularly, estimation techniques, both new and well-established, are studied in the context of recent research literature. Students do a literature review project of their own choosing which can be in any application area.
Credit Only Granted for: ENAE604 or ENAE788L.
Formerly: ENAE788L.

ENAE631 Helicopter Aerodynamics I (3 Credits)
A history of rotary-wing aircraft, introduction to hovering theory, hovering and axial flight performance, factors affecting hovering and vertical flight performance, autorotation in vertical descent, concepts of blade motion and control, aerodynamics of forward flight, forward flight performance, operational envelope, and introduction to rotor acoustics.
Prerequisite: ENAE414 and ENAE311. Or permission of ENGR-Aerospace Engineering department; and permission of instructor.

ENAE633 Helicopter Dynamics (3 Credits)
Flap dynamics. Mathematical methods to solve rotor dynamics problems. Flap-lag-torsion dynamics and identify structural and inertial coupling terms. Overview on rotary wing unsteady aerodynamics. Basic theory of blade aeroelastic stability and ground and air resonance stability, vibration analyses and suppression.
Prerequisite: ENAE631. Or permission of ENGR-Aerospace Engineering department; and permission of instructor.

ENAE634 Helicopter Design (3 Credits)
Principles and practice of the preliminary design of helicopters and similar rotary wing aircrafts. Design trend studies, configuration selection and sizing methods, performance and handling qualities analyses, structural concepts, vibration reduction and noise. Required independent design project conforming to a standard helicopter request for proposal (RFP).
Prerequisite: ENAE631. Or permission of ENGR-Aerospace Engineering department; and permission of instructor.

ENAE635 Helicopter Stability and Control (3 Credits)
Advanced dynamics as required to model rotorcraft for flight dynamic studies. Development of helicopter simulation models and specifications of handling qualities. Methods for calculation of trim, poles, frequency response, and free flight response to pilot inputs.
Prerequisite: ENAE631.
Restriction: Permission of ENGR-Aerospace Engineering department.

ENAE636 Helicopter Dynamics II (3 Credits)
Aerodynamics, dynamics and aeromechanics of helicopters and tilt rotor aircraft. Experimental testing and mathematical modeling required for the design and analysis of such aircraft.
Credit Only Granted for: ENAE788R or ENAE636.
Formerly: ENAE788R.

ENAE641 Linear System Dynamics (3 Credits)
Linear systems; state space, multi-input, multi-output models; eigenstructure; controllability, observability, singular value analysis; multivariable Nyquist condition; observer design; introduction to Kalman filtering. Full state feedback techniques including pole placement and LQR/LQG techniques; introduction to loop shaping and robustness.
Prerequisite: ENAE432.

ENAE642 Atmospheric Flight Control (3 Credits)
Exposure to flight guidance and control. Draws heavily from vehicle dynamics as well as feedback theory, and careful treatment of the non-linear aspects of the problem is critical. Conventional sythesis techniques are stressed, although modern methods are not ignored. Multivariable system analysis is included, along with flight-control design objectives and hardware limitations. Emphasis on aircraft and missiles.
Prerequisite: ENAE403 and ENAE432; or students who have taken courses with comparable content may contact the department.

ENAE644 Motion Planning for Autonomous Systems (3 Credits)
Autonomous systems (e.g., aircraft, vehicles, manipulators, and robots) must plan long-term movement that respects environmental constraints such as obstacles, other actors, and wind; system constraints such as kinematics, dynamics, and fuel; and other factors such as time and safety. Robust autonomy requires dealing with environmental changes, new information, and uncertainty. This course provides an overview of methods that solve a variety of motion planning problems. The course will cover both the theoretical and practical aspects of state-of-the-art motion planning algorithms. Course projects that use real autonomous systems will be facilitated and encouraged.
Prerequisite: Students are expected to be moderately proficient in at least one programming language.
Restriction: Must have permission from ENGR-Aerospace Engineering department.
Credit Only Granted for: ENAE644 or ENAE788V.
Formerly: ENAE788V.

ENAE646 Advanced Dynamics of Aerospace Systems (3 Credits)
Introduces the principles and methods for formulating and analyzing mathematical models of aerospace systems using Newtonian, Lagrangian, and Hamiltonian formulations of particle and rigid body dynamics. Additional topics include applied dynamical systems, geometric mechanics, and symmetry and reduction.
Prerequisite: ENAE301.
Credit Only Granted for: ENAE788G or ENAE646.
Formerly: ENAE788G.

ENAE647 Flexible Multi-body Dynamics (3 Credits)
Review of particle dynamics, rigid body kinematics, analytical dynamics, constraint equations in multibody dynamics, methods for enforcing kinematic constraint, formulation of flexible bodies in multibody dynamics, finite element modeling, and numerical integration methods.
Prerequisite: ENAE646.
Restriction: Must be in one of the following programs (ENGR: MS/PhD-Aerospace Engineering (Doctoral); ENGR: MS/PhD-Aerospace Engineering (Master's)).
Credit Only Granted for: ENAE788Q or ENAE647.
Formerly: ENAE788Q.

ENAE651 Smart Structures (3 Credits)
Topics related to the analysis, design, and implementation of smart structures and systems: modeling of beams and plates with induced strain actuation; shape memory alloys; electro-rheological fluids; magnetostrictor and electrostricter actuators and fiber optic sensors.

ENAE652 Computational Structural Mechanics (3 Credits)
Fundamentals of structural mechanics and computational modeling. Finite element modeling of two- and three-dimensional solids, plates and shells. Geometrically nonlinear behavior. Structural stability such as buckling and postbuckling.
Restriction: Permission of instructor; and permission of ENGR-Aerospace Engineering department.
Credit Only Granted for: ENME 674, ENAE652, ENPM652 or ENPM808F.

ENAE653 Nonlinear Finite Element Analysis of Continua (3 Credits)
Finite element formulation of nonlinear and time dependent processes. Introduction to tensors, nonlinear elasticity, plasticity and creep. Application to nonlinear solids including aerospace structures, such as shells undergoing finite rotations.
Prerequisite: ENAE652; or students who have taken courses with comparable content may contact the department.

ENAE654 Mechanics of Composite Structures (3 Credits)
An introduction to structures composed of composite materials and their applications in aerospace. In particular, filamentary composite materials are studied. Material types and fabrication techniques, material properties, micromechanics, anisotropic elasticity, introduction to failure concepts.

ENAE655 Structural Dynamics (3 Credits)
Advanced principles of dynamics necessary for structural analysis; solutions of eigenvalue problems for discrete and continuous elastic systems, solutions to forced response boundary value problems by direct, modal, and transform methods.

ENAE656 Aeroelasticity (3 Credits)
Topics in aeroelasticity: wing divergence; aileron reversal; flexibility effects on aircraft stability derivatives; wing, empennage and aircraft flutter; panel flutter; aircraft gust response; and aeroservoelasticity of airplanes.
Prerequisite: ENAE655.
Restriction: Permission of ENGR-Aerospace Engineering department.

ENAE661 Aircraft Propulsion and Power (3 Credits)
An introduction to air-breathing jet propulsion with the main emphasis on the fundamentals of gas turbine engines. It is intended for students with prerequisite knowledge of elementary fluid mechanics, gas dynamics, and thermodynamics.
Prerequisite: ENES232, ENAE414, and ENAE311.
Jointly offered with: ENAE455.
Restriction: Must be in Engineering: Aerospace program; or permission of ENGR-Aerospace Engineering department; and must have Senior or graduate standing.
Credit Only Granted for: ENAE455 or ENAE661.

ENAE662 Space Propulsion and Power (3 Credits)
Thermodynamic cycle analysis, aerothermochemistry of fuels and propellants, operating principles of rocket, ion, and other exoatmospheric power units.
Prerequisite: ENES232 and ENAE311; or equivalents.
Jointly offered with: ENAE457.
Restriction: Must be in Engineering: Aerospace program; or permission of ENGR-Aerospace Engineering department; and must have senior or graduate standing.
Credit Only Granted for: ENAE457, ENAE457H, ENAE662.

ENAE663 Introduction to Plasmas for Space Propulsion and Power (3 Credits)
Characteristics of plasmas, motion of charged particles in fields, collisional processes, kinetic theory, fluid desctiption of plasmas, transpot properties, equilibrium vs. non-equilibrium, generation of plasmas.
Recommended: PHYS270 or equivalent.

ENAE665 Advanced Airbreathing Propulsion (3 Credits)
Advanced treatment of airbreathing propulsion technologies, propulsion system analysis, and engine/airframe integration. Topics will vary, but may include novel engine cycles, advanced gas turbine systems, pulsed systems, and high-speed engines, including scramjets and combined cycle systems.
Prerequisite: ENAE455; or students who have taken courses with comparable content may contact the department.
Restriction: Permission of instructor.

ENAE667 Advanced Space Propulsion and Power (3 Credits)
Charged particle motion, drift mechanisms, plasma sheaths, creation of plasmas. Representative electrothermal, electrostatic, and electromagnetic propulsion technologies. Power production and direct-drive thrust generation using fusion as time permits.
Prerequisite: ENAE457 or equivalent.
Jointly offered with: ENAE467.
Restriction: Permission of instructor.
Credit Only Granted for: ENAE488I, ENAE467, or ENAE667.

ENAE673 Aerodynamics of Incompressible Fluids (3 Credits)
Introduces the fundamental concepts of incompressible flows. Topics to be addressed include the conservation equations, potential flow, lift and drag, Navier-Stokes equations, boundary layers and similarity solutions, and solutions to classical problems.
Prerequisite: Undergraduate courses in differential equations, incompressible, and compressible flow (ENAE311; and one course from ENAE414; ENME331, OR ENME640, or equivalent).
Restriction: Must be in ENGR: MS/PhD-Aerospace Engineering (Master's) program.

ENAE674 Aerodynamics of Compressible Fluids (3 Credits)
One-dimensional flow of a perfect compressible fluid. Shock waves. Two-dimensional linearized theory of compressible flow. Two-dimensional transonic and hypersonic flows. Exact solutions of two-dimensional isotropic flow. Linearized theory of three-dimensional potential flow. Exact solution of axially symmetrical potential flow. One-dimensional flow with friction and heat addition.
Restriction: Permission of ENGR-Aerospace Engineering department.

ENAE675 Unsteady Aerodynamics (3 Credits)
Classical theories of incompressible unsteady aerodynamics with an introduction to modeling techniques. Topics include: unsteady Bernoulli's equation, added mass, the indicial response method, dynamic stall, and modern applications.
Prerequisite: ENAE414; and permission of instructor.
Credit Only Granted for: ENAE672 or ENAE675.
Formerly: ENAE672.

ENAE676 Turbulence (3 Credits)
Physical and statistical descriptions of turbulence; review of phenomenological theories for turbulent flows; scales of motion; correlations and spectra; homogeneous turbulent flows; inhomogeneous shear flows; turbulent flows in pipes and channels; turbulent boundary layers; theory of methods for turbulent flows (Reynolds stress equations, LES, DES, DNS); experimental methods for turbulence measurements.
Prerequisite: ENAE673.
Recommended: ENAE674.

ENAE681 Engineering Optimization (3 Credits)
Methods for unconstrained and constrained minimization of functions of several variables. Sensitivity analysis for systems of algebraic equations, eigenvalue problems, and systems of ordinary differential equations. Methods for transformation of an optimization problem into a sequence of approximate problems. Optimum design sensitivity analysis.

ENAE682 Hypersonic Aerodynamics (3 Credits)
Hypersonic shock and expansion waves, Newtonian theory, Mach methods, numerical solutions to hypersonic inviscid flows, hypersonic boundary layer theory, viscous interactions, numerical solutions to hypersonic viscous flows. Applications to hypersonic vehicles.
Restriction: Permission of ENGR-Aerospace Engineering department.

ENAE683 High Temperature Gas Dynamics (3 Credits)
Aspects of physical chemistry and statistical thermodynamics necessary for the analysis of high temperature flows, equilibrium and nonequilibrium chemically reacting flows, shock waves, nozzle flows, viscous chemically reacting flow, blunt body flows, chemically reacting boundary layers, elements of radiative gas dynamics and applications to hypersonic vehicles.
Restriction: Permission of ENGR-Aerospace Engineering department.

ENAE684 Computational Fluid Dynamics I (3 Credits)
Partial differential equations applied to flow modelling, fundamental numerical techniques for the solution of these equations, elliptic, parabolic, and hyperbolic equations, elements of finite difference solutions, explicit and implicit techniques. Applications to fundamental flow problems.
Restriction: Permission of ENGR-Aerospace Engineering department.

ENAE685 Computational Fluid Dynamics II (3 Credits)
Continuation of ENAE 684. Basic algorithms for the numerical solution of two and three dimensional inviscid and viscous flows. Applications to internal and external flow problems.
Prerequisite: ENAE684.
Restriction: Permission of ENGR-Aerospace Engineering department.

ENAE688 Seminar (1-3 Credits)

ENAE691 Satellite Design (3 Credits)
Systems design of Earth-orbiting satellites, including geostationary communications satellites and low Earth orbit constellations. Basics of orbital motion, communications, and instrument design. Spacecraft systems, structural design, thermal design, power generation, and attitude determination and control. Launch vehicle interfacing and mission operations.
Prerequisite: ENAE483.

ENAE692 Introduction to Space Robotics (3 Credits)
Introduction to the kinematics, dynamics, and control of robot manipulators. DH parameters, serial and parallel manipulators, kinematic redundancy, sensors, actuators, and mechanism design. Control concepts introduced ranging from independent joint control to impedance control. Examples drawn from space robotics, wearable robotics, and other areas.
Prerequisite: ENAE301 or ENES221.
Recommended: ENAE432.

ENAE694 Spacecraft Communications (3 Credits)
Brief overview of satellite orbits. Radio frequency communications, noise, and bandwidth limitations. Link budget analysis. Modulation and multiplexing approaches, multiple access systems. Satellite transponder and Earth station technology.

ENAE696 Spacecraft Thermal Design (3 Credits)
Thermal sources in space. Black-body radiation; absorptivity and emissivity; radiative thermal equilibrium. Mutually radiating plates, view angles, and interior conduction. Techniques of spacecraft thermal analysis; approaches to passive and active thermal control.

ENAE697 Space Human Factors and Life Support (3 Credits)
Engineering requirements supporting humans in space. Life support design: radiation effects and mitigation strategies; requirements for atmosphere; water, food, and temperature control. Accommodations for human productivity in space: physical and psychological requirements; work station design; and safety implication of system architectures. Design and operations for extra-vehicular activity.

ENAE741 Interplanetary Navigation and Guidance (3 Credits)
Interplanetary trajectory construction; patched and multiconic techniques. Methods of orbit and attitude determination; applied Kalman filtering. Guidance algorithms and B-plane targeting. Interplanetary navigation utilizing in situ and radio techniques.
Prerequisite: ENAE601 and ENAE432.

ENAE743 Applied Nonlinear Control of Aerospace Systems (3 Credits)
Mathematics and methods of nonlinear systems analysis and nonlinear control design, including nonlinear models and phenomena, Lyapunov stability, input-output stability, passivity and frequency domain analysis, nonlinear controllability and observability, feedback linearization, sliding mode control, and integrator backstepping.
Prerequisite: ENAE641.

ENAE757 Advanced Structural Dynamics (3 Credits)
Demonstrate the practical application of Smart Materials and Spatially Distributed Transducers to the design and control of advanced structures. The course will be focused toward the active control of continuum structures using advance Spatially Distributed Parameter System control techniques and concepts. Effective system parameterizations will be used to reduce distributed parameter system models to classical canonical state space form for the purpose of robust adaptive structure design. Application case studies, including morphing structures will be employed as necessary to enhance the students intuition and understanding of Distributed Parameter Systems.
Prerequisite: ENAE655; or students who have taken courses with comparable content may contact the department.

ENAE788 Selected Topics in Aerospace Engineering (1-3 Credits)

ENAE791 Launch and Entry Vehicle Design (3 Credits)
Design of aerospace vehicles for atmospheric transit to and from space. Generic formulation of atmospheric flight dynamics. Ballistic and lifting entry trajectories. Estimation of vehicle aerodynamic properties and aerothermodynamic heating. Entry thermal protection design. Trajectory analysis of sounding rockets and orbital launch vehicles. Serial, parallel, and hybrid multistaging schemes, optimal multistaging. Constrained trajectory optimization. Launch vehicle economic and reliability analysis, flight termination systems, sensors and actuators.
Prerequisite: ENAE601.

ENAE799 Master's Thesis Research (1-6 Credits)

ENAE898 Pre-Candidacy Research (1-8 Credits)

ENAE899 Doctoral Dissertation Research (1-8 Credits)

ENCE - Engineering, Civil

ENCE401 Statistical and Machine Learning Models for Natural Hazards Prediction (3 Credits)
Infrastructure and other engineered systems are exposed to a variety of natural hazards, such as precipitation, high winds, storm surge, and earthquake-induced ground shaking. Assessment of the risks involves the development of models to predict hazard severity. While these models may involve a range of techniques, this course centers on prediction models that involve statistical and machine-learning approaches. Specifically, this course will focus on the practical application of statistical and machine learning regression models, including data processing, model specification, model development, and model assessment within the context of natural hazard predictions. Models selected for consideration in this course are informed by present-day practices for multiple types of natural hazards.
Prerequisite: ENCE203 or experience with a programming language (e.g., Python, R, MATLAB); ENCE303 or another course that provides the relevant probability/statistics required content; and permission of the ENGR-Civil and Environmental Engineering department.
Jointly offered with: ENCE601.
Credit Only Granted for: ENCE401, ENCE489X, ENCE601, or ENCE689X.
Formerly: ENCE489X.

ENCE402 Simulation and Design of Experiments for Engineers (3 Credits)
Review of statistics and hypothesis testing, sample design and design of experiments, generation of discrete and continuous distributions and their applications. Introduction of simulation languages and simulation of discrete and continuous engineering systems. Output analysis, model validation and sensitivity and reliability analysis.
Prerequisite: ENCE302; and permission of ENGR-Civil & Environmental Engineering department.

ENCE403 Sustainability and Smart Green Cities (3 Credits)
Introduces the principles and components of smart green cities. System approach to sustainability and green city development is examined. City wide action plan components are reviewed and analysed in regards to sustainability, resilience, social and economic elements. The UN Sustainability development goals are covered as pertinent to smart green cities. Green initiatives and C40 emission reduction plans and components are reviewed. The course introduces concepts and calculations of sustainable energy and electric vehicles, sustainability assessments and rating of Smart Green Cities. Case studies on such topics are reviewed and discussed.
Prerequisite: MATH140 .
Credit Only Granted for: ENCE489C or ENCE403.
Formerly: ENCE489C.

ENCE404 Sustainable Infrastructure & Condition (3 Credits)
Introduces the principles of sustainability, sustainability metrics applied to civil infrastructure. Resiliency of civil infrastructure and rating criteria are examined as well. Condition assessment of civil infrastructure and Non-Destructive Evaluation, NDEs, principles and methods are introduced and case studies are examined. Performance modeling alternative methods are reviewed. Example and analysis of GHG mitigation strategies and carbon sequestration techniques for infrastructure materials and structures are introduced. Development of sustainable rehabilitation methods applied to civil infrastructure are covered as well.
Prerequisite: MATH140 .
Credit Only Granted for: ENCE489G or ENCE404.
Formerly: ENCE489G.

ENCE405 Sustainability, Thermal Comfort & Urban Heat Islands (3 Credits)
Sustainability principles applied to urban areas. Methods and analysis for urban heat islands. Heat balance analysis. Surface albedo assessment techniques. Thermal comfort principles and analysis methods. Alternative materials and permeable/ impermeable surface materials for GHG reduction and UHI. Safety assessment of sustainable roadways: principles and measurements.
Prerequisite: MATH140 .
Credit Only Granted for: ENCE489I or ENCE405.
Formerly: ENCE489I.

ENCE411 Environmental Engineering Science (3 Credits)
Introduces the analytical techniques available to assess performance of engineering processes as they relate to water, soil, and air treatment and quality. The basic principles of environmental management, economics of waste treatment, by-product reutilization, and energy cycles are introduced and discussed. Alternative technologies are introduced and evaluated mostly by assessing their potential to reduce waste, minimize energy use, and promote sustainability. Students' activities include, a weekly lab to provide hands-on experience with environmental quality measurements and treatment techniques; on-site visits to regional industries that undertake sustainable practices; and a final research project where experimental design and laboratory techniques are used to assess interactions between technologies and natural systems and their potential for reducing environmental impacts.
Prerequisite: ENCE205 and ENCE310; and permission of ENGR-Civil & Environmental Engineering department.

ENCE412 Environmental Engineering Unit Operations (3 Credits)
Examination of unit operations and processes encountered in environmental engineering field. Fundamental principles learned from previous classes will be applied into the design and operation of unit operations and processes, particularly in the area of water and wastewater treatment. Similar processes will be applied to air pollution control, solid waste disposal and hazardous waste treatment.
Prerequisite: ENCE305 and ENCE310; and permission of ENGR-Civil & Environmental Engineering department.

ENCE420 Selection and Utilization of Construction Equipment (3 Credits)
Learn to evaluate and select construction equipment with a focus on mechanized equipment for earthwork and building construction.Learn about the parties involved in procurement, operation and maintenance, and how to cost-effectively plan, select, and utilize equipment for earthmoving, paving, formwork, trenching, rock excavation, tunneling, site preparation, and steel and concrete construction. Explore trends in equipment design, construction automation, and robotics.
Prerequisite: Permission of ENGR-Civil & Environmental Engineering department.
Restriction: Must be in a major in ENGR-A. James Clark School of Engineering; or must be in the Construction Project Management minor.

ENCE421 Legal Aspects of Architectural and Engineering Practice (3 Credits)
Learn the basic structure of the US legal system and court procedures and legal principles relevant to architectural and engineering design and construction contracts including principles of ethical, legal and professional conduct of engineers and architects.Topics include: contracts for design and construction, sales and warranties, torts and product liability, business agency and government agencies, professional liability of architects and engineers, labor laws, expert testimony, mediation and arbitration, tangible property including real estate, intellectual property including trademarks, patents and copyrights, insurance and sureties.
Restriction: Must be in a major in ENGR-A. James Clark School of Engineering; or must be in the Construction Project Management minor; or must be in the Project Management Minor. And permission of ENGR-Civil & Environmental Engineering department.

ENCE422 Project Cost Accounting and Economics (3 Credits)
Learn: the fundamentals of accounting; project cost accounting principles as they apply to project management; project cost accounting; and the fundamentals of engineering economics.Topics include: project feasibility analysis; reading and analyzing financial statements; cash management; cash flow analysis; depreciation and taxes; and impact on profitability; the principles of activity based costing; net present value analysis; the framework for project performance measurement, cost performance indices, and earned value analysis.
Prerequisite: Permission of ENGR-Civil & Environmental Engineering department.
Restriction: Must be in a major in ENGR-A. James Clark School of Engineering; or must be in the Construction Project Management Minor; or must be in the Project Management Minor.

ENCE423 Project Planning, Estimating & Scheduling (3 Credits)
Learn the fundamentals of project planning, estimating, and scheduling. Understand the concepts of planning; to reduce uncertainty, improve efficiency of the operation, to set and meet objectives, and to provide a basis for monitoring and controlling the work. Be introduced to: the concepts of resource definition, assignment and management, and; the basics of project estimating (pricing) methods including global pricing strategies, types of estimates, pricing processes, overhead and profit, and project financing.Learn the basics of project scheduling including; bar charts, network-based methodologies, and linear scheduling techniques. Emphasis is placed on Critical Path Method (CPM) scheduling, a network based methodology. Be exposed to the use of scheduling software and will actually develop a CPM schedule for an actual construction project as part of a semester project.
Restriction: Must be in a major in ENGR-A. James Clark School of Engineering; or must be in the Construction Project Management Minor; or must be in the Project Management Minor. And permission of ENGR-Civil & Environmental Engineering department.

ENCE424 Communication for Project Managers (3 Credits)
Learn the fundamentals of communications for project managers. Emphasis is on interpersonal and group communications; through voice, electronic, and written messages; project cycle and reports and presentations during this cycle; and communications for employment.
Prerequisite: Permission of ENGR-Civil & Environmental Engineering department.
Jointly offered with: ENCE614.
Restriction: Must be in a major in ENGR-A. James Clark School of Engineering; or must be in the Construction Project Management minor; or must be in the Project Management minor.
Credit Only Granted for: ENCE424 or ENCE614.

ENCE426 Construction Documentation and BIM Applications in Engineering and Construction (3 Credits)
Learn the basics of construction documentation methods, with particular emphasis on Building Information Modeling (BIM). Topics include: the fundamentals of assembly, coordination, and maintenance of construction documents and implementation of BIM techniques in the design and construction processes, and; a review of Autodesk, Revit, and Navisworks and other leading BIM software. Lectures from project management faculty supplemented by guest lecturers from the construction industry.
Prerequisite: Permission of ENGR-Civil & Environmental Engineering department.
Restriction: Must be in a major in ENGR-A. James Clark School of Engineering; or must be in the Construction Project Management Minor; or must be in the Project Management Minor.

ENCE430 Introduction to Infrastructure and Resilience (3 Credits)
Develops system-level skills for the planning, design, maintenance, and operation of resilient infrastructure systems. Through this course, we will discuss a variety of infrastructure systems, both public and private, and their role in communities before and after disasters. The themes of the course will be grounded in the four phases of emergency management (mitigation, preparedness, response, and recovery) and the role that infrastructure plays in each. Through these applications areas, we will study a variety of conceptual, analytical, and computational models that support informed decision-making for these systems under uncertainty.
Prerequisite: ENCE302; or students who have taken courses with comparable content may contact the department.
Corequisite: ENCE360; or students who have taken courses with comparable content may contact the department. Jointly offered with ENCE632.
Credit Only Granted for: ENCE632, ENCE688U, ENCE430 or ENCE489U.
Formerly: ENCE489U.

ENCE431 Hydrologic Engineering (3 Credits)
An introduction to basic principles of hydrologic science including the hydrologic cycle, rainfall, surface runoff and streamflow. Special emphasis is placed on hydrologic engineering design of stormwater management and flood control facilities. Design projects are used to illustrate design practices.
Prerequisite: ENCE305; and permission of ENGR-Civil & Environmental Engineering department.

ENCE432 Ground Water Hydrology (3 Credits)
Concepts related to the development of the ground water resources, hydrology, hydrodynamics of flow through porous media, hydraulics of wells and basin-wide ground water development. Fundamentals of ground water pollution are introduced.
Prerequisite: ENCE305; and permission of ENGR-Civil & Environmental Engineering department.

ENCE436 Environment and Water II: Water Management (3 Credits)
Covers the essential principles and practices of water resources management, focusing on the sustainable design and operation of water systems. Students will examine key topics such as hydrology, stormwater management, groundwater flow, and water quality. Through hands-on projects, students will design water supply systems, flood management strategies, and stormwater management plans while considering economic, legal, and environmental factors. The course emphasizes the integration of technical and governance aspects in managing water resources to address global water challenges and prepare students for professional practice.
Prerequisite: Minimum grade of C- in ENCE336 and ENCE305.
Restriction: Permission of the ENGR-Civil & Environmental Engineering Department.

ENCE441 Foundation Design (3 Credits)
Critical review of classical lateral earth pressure theories, analysis of retaining walls and reinforced earth walls, subsurface explorations, bearing capacity and settlement of shallow foundations, design of deep foundations that includes both pile foundations and drilled shafts.
Prerequisite: ENCE340; and permission of ENGR-Civil & Environmental Engineering department.

ENCE442 Structural Analysis and Design II (3 Credits)
Introduces students to the structural design process, with a focus on decision-making using design codes and standards. Students will apply design methods to reinforced concrete, steel, and mass timber structures, considering life-cycle costs, sustainability, and environmental impacts. The course will cover design loads, load-resisting systems, and the principles of reinforced concrete and steel design.
Prerequisite: Minimum grade of C- in ENCE342; and must have completed or be concurrently enrolled in ENCE340.
Restriction: Permission of the ENGR-Civil & Environmental Engineering Department.

ENCE444 Experimental Methods in Geotechnical Structural Engineering (3 Credits)
In the geotechnical engineering part of the course, major soils testing and their interpretation including classification, compaction, strength, and compressibility will be undertaken. The structural engineering part of this course covers test planning, loading apparatus, instrumentation, data acquisition and data analysis, as well as basic aspects of structural testing techniques and shake-table test.
Prerequisite: ENCE353 and ENCE340; and permission of ENGR-Civil & Environmental Engineering department.

ENCE447 Pavement Engineering (3 Credits)
Fundamental principles underlying the design, construction, maintenance and repair, and management of highway and airfield pavement systems. Pavement performance (functional/structural; evaluation); pavement mechanics (multi-layered elastic theory; slab theory); pavement materials (properties and characterization); environmental effects; current rigid and flexible design methods (new/rehabilitation); construction (new construction; maintenance/repair; rehabilitation); economic evaluation; pavement management.
Prerequisite: ENCE340; and permission of ENGR-Civil & Environmental Engineering department.

ENCE451 Design of Timber Structures (4 Credits)
Mass timber refers to a family of engineered wood products of large section size that provide the construction industry with a sustainable and viable alternative to steel and concrete. This course introduces students to the design of mass timber structures, a cutting-edge and eco-friendly building technology. Topics include the analysis and design of dimensional lumber and mass timber components such as Cross-Laminated Timber (CLT) and Glued Laminated Timber (Glulam). Specific focus areas include: Tension members; Beams (flexural members); Columns; Floor diaphragms; Shear walls; Connections; Fire-resistance design and acoustic considerations in the design. The course adopts a project-based learning approach to foster practical understanding and application.
Prerequisite: ENCE353 or another course that provides the relevant structure analysis required content; and permission of the ENGR-Civil and Environmental Engineering department.
Credit Only Granted for: ENCE689W or ENCE451.

ENCE453 Computer-Aided Structural Analysis (3 Credits)
Computer-aided analysis of structural systems. Unified matrix formulation of stiffness and flexibility methods. Slope deflection method. Evaluation of truss, frame, and grid systems. Non-prismatic and curved elements. Error analysis and determination of ill-conditions. Introduction to finite element methods; formulation of simple two-dimensional elements. In laboratory, use and development of CAD software.
Prerequisite: ENCE353; and permission of ENGR-Civil & Environmental Engineering department.

ENCE454 Design of Concrete Structures (3 Credits)
Combined bending and compression, development and anchorage of reinforcement, deflections, design of slabs including one-way and two-way, design of footings, retaining walls, introduction to prestressed concrete, design of multi-story buildings.
Prerequisite: ENCE353; and permission of ENGR-Civil & Environmental Engineering department.
Formerly: ENCE451.

ENCE455 Design of Steel Structures (3 Credits)
Behavior and design of members subjected to fatigue, and combined bending and compression; plate girders, composite beams, open-web joists and connections. Methods of allowable stress design, and load and resistance factor design. Elements of plastic analysis and design. Framing systems and loads for industrial buildings and bridges.
Prerequisite: ENCE353; and permission of ENGR-Civil & Environmental Engineering department.

ENCE464 Civil and Environmental Engineering Design I (2 Credits)
This experiential course provides structured and unstructured time for group work as part of the senior capstone design course. The course gives students a chance to practice the skills acquired throughout a student's academic career. The course provides students with hands-on experience similar to the experience encountered by new engineers in professional engineering and construction practice. The course offers students an opportunity to develop the leadership and group work skills needed to meet professional expectations.
Prerequisite: Minimum grade of C- in ENCE367, ENCE356, ENCE336, and ENCE342.
Restriction: Permission of the ENGR-Civil & Environmental Engineering Department.
Credit Only Granted for: ENCE465 or ENCE464.
Formerly: ENCE465.
Additional Information: Must be taken in the last year.

ENCE465 Civil and Environmental Engineering Design I (1 Credit)
Provides students an opportunity to develop their skills in project scoping and the development of design proposals. The fundamental concepts are taught using analytical and computational methods, which are necessary for designing and analyzing the sustainability of various engineering processes and technologies. The course provides the methods and skills for understanding the human-environment-infrastructure interactions needed to develop a design proposal.
Prerequisite: ENCE201 and ENCE215.
Restriction: Permission of the ENGR-Civil & Environmental Engineering Department.

ENCE467 Civil and Environmental Engineering Design II (2 Credits)
This experiential course provides structured and unstructured time for groupwork as part of the senior capstone design course sequence. The course builds on skills acquired throughout a student's academic career extending a project defined and scoped in ENCE465. The objective of this course is to provide students with hand's on experience similar to the experience encountered by new engineers working in professional engineering and construction practice. The course offers students an opportunity to develop the leadership and groupwork skills needed to meet professional expectations.
Prerequisite: ENCE465; and must have completed or be concurrently enrolled in ENCE302 and ENCE305.
Restriction: Permission of the ENGR-Civil & Environmental Engineering Department.

ENCE470 Highway Engineering (3 Credits)
Highway location and design, highway engineering economics, traffic engineering, traffic measurement devices and technologies. Includes discussion of technological advances in traffic flow and capacity, such as signal systems, corridor control, automatic driver information, incident detection and autonomous vehicle operation.
Prerequisite: ENCE302 and ENCE370; and permission of ENGR-Civil & Environmental Engineering department.

ENCE472 Transportation Engineering (3 Credits)
Transportation engineering concepts including transportation systems analysis, airport systems, airline and airport operations, marine transportation and urban public transportation systems.
Prerequisite: ENCE302 and ENCE370; and permission of ENGR-Civil & Environmental Engineering department.

ENCE482 Innovations in Materials and Technologies for Future Civil Infrastructure (3 Credits)
The future of civil infrastructure depends on novel materials that are stronger, smarter, and more sustainable, as well as new construction technologies that are faster, more reliable, and less labor-intensive. This course explores the latest breakthroughs in civil engineering materials and technologies. Students will explore how cutting-edge materials and construction technologies are transforming the civil engineering practice. Through lectures, assignments, hands-on demonstrations, and projects, students gain the skills to innovate, design, and implement next-generation materials and technologies that help to tackle the urgent challenges in sustainable and digital civil infrastructure.
Prerequisite: Minimum grade of C- in ENCE300; and permission of the ENGR-Civil & Environmental Engineering department.
Jointly offered with: ENCE682.
Credit Only Granted for: ENCE482 or ENCE682.

ENCE483 Transportation Systems II (3 Credits)
Introduces students to the characteristics, design, and analysis of various transportation systems, including roads, railways, urban transit, air transportation, and marine transportation. Students will explore the infrastructure and vehicles for passenger and freight transportation across different modes. The course covers topics in the geometric design of transportation systems, performance evaluation, system modeling, and optimization. Students will apply optimization, statistical, and economic analysis methods in designing and operating transportation systems.
Prerequisite: Minimum grade of C- in ENCE383.
Restriction: Permission of the ENGR-Civil & Environmental Engineering Department.

ENCE489 Special Problems in Civil Engineering (1-4 Credits)
A course arranged to meet the needs of exceptionally well prepared students for study in a particular field of civil engineering.
Prerequisite: Permission of ENGR-Civil & Environmental Engineering department.
Restriction: Senior standing.
Repeatable to: 9 credits if content differs.

ENCE601 Statistical and Machine Learning Models for Natural Hazards Prediction (3 Credits)
Infrastructure and other engineered systems are exposed to a variety of natural hazards, such as precipitation, high winds, storm surge, and earthquake-induced ground shaking. Assessment of the risks involves the development of models to predict hazard severity. While these models may involve a range of techniques, this course centers on prediction models that involve statistical and machine-learning approaches. Specifically, this course will focus on the practical application of statistical and machine learning regression models, including data processing, model specification, model development, and model assessment within the context of natural hazard predictions. Models selected for consideration in this course are informed by present-day practices for multiple types of natural hazards.
Jointly offered with: ENCE401.
Restriction: Permission of the ENGR-Civil department.
Credit Only Granted for: ENCE401, ENCE489X, ENCE601, or ENCE689X.
Formerly: ENCE689X.
Additional Information: Students must have prior coursework similar to the content offered in undergraduate courses ENCE203 and ENCE303.

ENCE602 Project Procurement Management (3 Credits)
Fundamental concepts and techniques for project acquisition and procurement are presented. Students are introduced to the PMBOK Guide six-step procurement process and expected to develop an in-depth understanding of project evaluation, planning, financing, contracting, negotiation, and procurement execution. It will also cover emerging methods, principles, and practices in infrastructure project procurement, including Public-Private Partnerships, Carbon project procurement, and Clean Development Mechanism.

ENCE603 Bayesian Data Analytics for Engineering (3 Credits)
Introduction to identifying, analyzing, assessing, and managing data inherent to engineering projects. Includes: statistical principles, concepts, and models; decision science aspects of data systems; Bayesian methods; measurement theory; subjective aspects of statistics and data appraisal. Examples are drawn from software development, systems integration, and other large engineering projects. Covers statistical basics, subjective probability, Bayesian data analysis, introduction to decision theory, Monte Carlo simulation, value of information, and risk-based decision making from data.
Recommended: ENCE627.

ENCE604 Sustainabilty Fundamentals for Project Managers (3 Credits)
Addresses the fundamentals of sustainability for project managers including best practices of modern sustainable construction and project management. Commercial and residential buildings consume about 40 percent of the energy used in the United States. The course therefore emphasizes the application of the sustainable development goals to the built environment, including the practical operational aspects of sustainable facility project management and sustainable construction by contractors. The course also will cover the fundamental concepts of sustainable project development and the move towards economic prosperity, environmental protection, and social equity, taking all three dimensions into account to achieve sustainability. Project managers need to take responsibility for more sustainable development of organizations, facilities, and projects.

ENCE605 Evolving as a Project Leader (3 Credits)
Projects are now used by many organizations for the implementation of strategic initiatives. This means that project managers must be able to do more than manage, organize, and control. They must be able to lead the project team and its stakeholders through change. This course explores four themes 1) Leadership theory with an emphasis on servant and situational leadership; 2) Vital leadership skills; 3) Project leadership in traditional and agile projects; and, 4) Developing your leadership skills.

ENCE606 Graduate Introduction to Project Scheduling (3 Credits)
Students are taught the basics of project scheduling and the various scheduling approaches that are currently being used in the design and construction industry. Project planning techniques will be covered and basic scheduling methods will be taught including the use of bar charts. Critical Path Method (CPM), Program Evaluation and Review (PERT) and Linear Scheduling (Line of Balance) methods.

ENCE607 Mastering Agile Project Management (3 Credits)
Learn how and why Agile project management is the fastest growing and most successful project management philosophy today. Learn the mechanics of how to design and facilitate projects using pure Agile Scrum and Lean Kanban techniques; The tradeoffs of using hybrid techniques such as Lean Startup, Scaled Agile for the Enterprise, and Disciplined Agile Development. Then go beyond these frameworks to the science beneath with the essential principles to ensure you get the best benefits of Agile project management methods.

ENCE610 Fundamentals of Structural Analysis (3 Credits)
Cartesian tensor notation. Linear forms of the general equilibrium, compatability, and constitutive equations. The calculus of variations. The principles of virtual work and complementary virtual work. Self-adjoint problem formulations.

ENCE611 Finite Element Methods (3 Credits)
Basic principles and fundamental concepts of the finite element method. Consideration of geometric and material nonlinearities, convergence, mesh gradation and computational procedures in analysis. Applications to plane stress and plane strain, plates and shells, eigenvalue problems, axisymmetric stress analysis, and other problems in civil engineering.
Formerly: ENCE661.

ENCE613 Structural Dynamics (3 Credits)
Analysis of the dynamic response of structrues and structural components subjected to impact load, transient load, and ground excitations; study of single degree-of-freedom and multi degree-of-freedom systems in classical closed form solution and approximate numerical solution; solution in the frequency domain and the use of finite element method.
Formerly: ENCE653.

ENCE620 Risk Analysis in Engineering and Economics (3 Credits)
Covers quantitative risk analysis and management using probability theory and statistics starting with system definition, hazard and scenario identification, likelihood estimation and consequence assessment, and finishes with economic valuation and microeconomics for informing decision making. Students will learn uncertainty, risk; natural and anthropogenic hazards and fundamental risk methods; analytical and empirical reliability and resilience estimation for components and systems; consequence, severity and loss analysis and accumulation including property and life; risk-cost-benefit tradeoffs and analysis; microeconomics and socioeconomics in risk analysis for informing decisions; and expert-opinion elicitation; among others.
Jointly offered with: ENCE410.
Restriction: Permission of the Civil and Environmental Engineering Department.
Credit Only Granted for: ENCE410, ENCE620, ENCE489L, ENRE648M or ENSE698R.
Formerly: ENRE648M and ENSE698R.
Additional Information: Students must have prior coursework similar to the content offered in undergraduate course ENCE303.

ENCE621 Uncertainty Modeling and Analysis (3 Credits)
Definition of engineering systems, knowledge levels using information science concepts as applied to engineering systems, sources and types of knowledge and ignorance, uncertainty sources and types for engineering systems, probability models, statistical models, fuzziness, fuzzy sets, fuzzy logic, fuzzy arithmetic, imprecise probabilities, evidence methods, uncertainty measures, uncertainty management, uncertainty reduction, applications of these analytical methods to engineering systems and in decision making.
Prerequisite: ENCE302; or students who have taken courses with comparable content may contact the department.

ENCE622 Construction Automation & Robotics (3 Credits)
Covers advanced technologies leading to redesign and partial or full automation of selected construction processes utilizing industrial robotics. Lectures and presentations will cover topics such as basic robotic technology (robot kinematics and dynamics, industrial manipulators, mobility bases, end effectors, sensors, control systems, and robot task programming), design of automated construction processes, selection of means and methods for automated construction processes, robot ergonomics and safety, calculation of costs and benefits of construction robots in selected applications, engineering and economic feasibility of automation and robotics in the construction industry.

ENCE623 Introduction to Advanced Scheduling (3 Credits)
A Combination of lecture and hands-on use of software to develop advanced knowledge and skills necessary to master advanced scheduling techniques for project management and control will be used. No software purchase is necessary.
Prerequisite: ENCE423 or ENCE662.
Credit Only Granted for: ENCE623 or ENCE688S.

ENCE625 Project Administration (3 Credits)
Principles of project administration procedures from the viewpoint of a resident project manager or project engineer on a construction or engineering project. The course specifically addresses the project administration responsibilities of the project manager or project engineer in the engineering, design, or construction industries. Students with a background in the private sector or the government sector will benefit. The course takes a project team approach for improved job efficiency, outlining a project team operation in which the office project administrator delegates to the greatest possible extent all those project administrative functions that can be done more efficiently in the field. The class also addresses the responsibilities and risks that a project administrative manager is likely to encounter. The course is suitable for students, engineering and design professionals, project managers, experienced contract administrators, and owners interested in the special administrative problems of engineering or construction.

ENCE626 Information Technologies for Project Managers (3 Credits)
Introduction to various information technology (IT) and automation-based solutions for project managers in capital project industries, including IT and automation tools for major life-cycle stages of a project: planning, design, fabrication/construction, operation, maintenance, retrofit and demolition/recycling. Both established and experimental approaches and tools will be covered. Building/Product Information Modeling software, sensing devices, field data acquisition and processing for project controls, status reporting, materials and equipment management, environmental monitoring, work-site safety and facility operations and management will be presented and analyzed. Web-based project management software solutions and applications for mobile devices such as tablets and smart phones will be featured in classroom presentations and materials provided to the students. Real project case studies from project-based firms will be used to illustrate the feasibility and usability of the tools presented in class. Students will be expected to acquire hands-on knowledge and experience with selected tools of particular interest in support of their future career paths.
Prerequisite: ENCE662.

ENCE627 Project Risk Management (3 Credits)
Introduction to identifying, analyzing, assessing, and managing risks inherent to engineering projects. Includes: probability modeling, choice and value theory, schedule and cost risk, risk mitigation and transfer, and contract considerations of project risk. Examples are drawn from construction, software development, systems integration, and other large engineering projects; and cover probability basics, subjective probability, statistical data analysis, introduction to decision theory, Monte Carlo simulation, value of information, and risk-based decision making.
Restriction: Must not have completed ENCE627.

ENCE630 Environmental and Water Resource Systems I (3 Credits)
Application of statistical and systems engineering techniques in the analysis of information necessary for the design or characterization of environmental or hydrologic processes; emphasis on the fundamental considerations that control the design of information collection programs, data interpretation, and the evolution of simulation models used to support the decision-making process.

ENCE631 Hydrologic Analysis and Nonpoint Pollution Models (3 Credits)
A detailed analysis of the physical processes controlling the spatial distribution of runoff and constituent transport during rainfall and snowmelt events. Emphasis is on developing an understanding of the processes and translating this understanding into practical models that can be used for runoff simulation, stormwater management, and environmental impact assessment.

ENCE632 Introduction to Infrastructure and Resilience (3 Credits)
Develops system-level skills for the planning, design, maintenance, and operation of resilient infrastructure systems. Through this course, we will discuss a variety of infrastructure systems, both public and private, and their role in communities before and after disasters. The themes of the course will be grounded in the four phases of emergency management (mitigation, preparedness, response, and recovery) and the role that infrastructure plays in each. Through these applications areas, we will study a variety of conceptual, analytical, and computational models that support informed decision-making for these systems under uncertainty.
Prerequisite: ENCE302; and ENCE360. Or students who have taken courses with comparable content may contact the department.
Credit Only Granted for: ENCE688U, ENCE632, ENCE489U or ENCE430.
Formerly: ENCE688U.

ENCE633 Assessment of Natural Hazards for Engineering Applications (3 Credits)
Ensuring the resilience of infrastructure and other engineered systems requires an assessment of the natural hazards to which the systems are exposed. Probabilistic natural hazard assessment evaluates how likely a location is to experience hazard events (e.g., hurricanes or earthquakes) and how likely those events are to cause various impacts (e.g., large surges, intense rainfall, high winds, or ground shaking). This course will review the basic science of natural hazards and provide the foundational concepts of probability and statistics required for developing models to assess the frequency and severity of natural hazards. This course will present methodologies for assessment of multiple types of natural hazards (e.g., seismic, precipitation, riverine, coastal, and wind hazards).
Prerequisite: ENCE302.
Jointly offered with: ENCE433.
Credit Only Granted for: ENCE633 or ENCE433.

ENCE635 Geographic Information Systems for Watershed Analysis (3 Credits)
Emphasis is on the use of GIS to support the analysis and modeling tasks associated with watershed planning and management. This course familiarizes the student with fundamentals of GIS data models, projections, and coordinate systems. Students develop a set of GIS-based alogrithms solving common engineering problems in hydrology. Internet data sources and GPS technology are also covered.
Credit Only Granted for: ENCE524 or ENCE688Z.
Formerly: ENCE688Z.

ENCE637 Biological Principles of Environmental Engineering (3 Credits)
An examination of biological principles directly affecting man and his environment, with particular emphasis on microbiological interactions in environmental engineering related to air, water and land systems; microbiology and biochemistry of aerobic and anaerobic treatment processes for aqueous wastes.

ENCE640 Advanced Soil Mechanics (3 Credits)
Introduction to the use of elastic theory in stress and displacement solutions to geotechnical engineering (soil and rock mechanics). The effect of soil moisture (at rest) relative to effective stress principles, capillary and frost. Exact and numeric techniques for the analysis for soil seepage under isotropic and anisotropic conditions. Classical settlement (consolidation) and compressiblility theories, including finite difference solution for vertical and radial drainage.
Prerequisite: ENCE340; or students who have taken courses with comparable content may contact the department.

ENCE641 Advanced Foundations Systems (3 Credits)
Review of soil properties and subsurface exploration, evaluation and design of shallow foundations, including settlement and bearing capacity of spread footings and mats. Discussion of methods of soil improvement. Analysis and design of deep foundations including single pile, pile load testing, pile group actions, and drilled shaft foundations for both vertical and horizontal loads. Load and resistance factor design concepts will be presented.
Prerequisite: ENCE340; or students who have taken courses with comparable content may contact the department.

ENCE644 Advanced Pavement and Civil Engineering Materials (3 Credits)
Advanced course in Highway and Civil Engineering Materials. Dynamic Material Characterization. Elastic, Plastic and Viscoelastic Behavior. Energy Analysis. Physical and Mechanical Properties. NDT. Performance: Creep, Fatigue, Durability, other. Recent developments in Aggregate Evaluation, Portland Cement Concrete, High Performance Concrete, Conventional and Modified Asphalt Binders and Mixtures, Polymers & Composites, Geotextiles, Smart and Self Healing Materials, Recycled and Reclaimed Materials.
Prerequisite: ENCE300.
Credit Only Granted for: ENCE644 or ENCE688P.
Formerly: ENCE688P.

ENCE645 Geotechnics of Waste Disposal (3 Credits)
Fundamental aspects of geotechnical engineering that apply to problems of waste containment and remediation, basic principles of containment systems, compacted clay liners and clay mineralogy, hydraulic conductivity of compacted soils, methods of laboratory and field hydraulic conductivity measurements, design of waste containment systems, landfill stability and settlement, geosynthetic liners, waste compatibility, contaminant transport through liners, leachate collection systems, gas collection systems, covers and caps.
Credit Only Granted for: ENCE489X, ENCE645, or ENCE688X.
Formerly: ENCE688X.

ENCE647 Slope Stability and Seepage (3 Credits)
Theoretical and practical aspects of seepage effects, and groundwater flow, review of shear strength principles, flow through porous media, hydraulic conductivity, flow nets, determination of water pressure, seepage forces and quantity of seepage, laboratory and field tests for shear strength, infinite slopes, block analysis, method of slices, seismic analysis of slopes, effective and total stress analysis, computer program for slope stability analysis, slope stability problems in waste disposal, construction excavations, reinforced embankments, embankments on soft ground.
Prerequisite: ENCE340.
Credit Only Granted for: ENCE489A, ENCE647, or ENCE688A.
Formerly: ENCE688A.

ENCE650 Process Dynamics in Environmental Systems (3 Credits)
The fundamentals of heterogeneous equilibria, rates of environmental reactions, and flow and material transport or presented. Applications of these principles will be presented to small and large scale environmental problems involving liquid, gas, and solid phases. Both natural and engineered environmental systems will be examined.
Formerly: ENCE636.

ENCE651 Chemistry of Natural Waters (3 Credits)
Application of principles from chemical thermodynamics and kinetics to the study and interpretation of the chemical composition of natural waters is rationalized by considering metal ion solubility controls, pH, carbonate equilibria, adsorption reactions, redox reactions and the kinetics of oxygenation reactions which occur in natural water environments.
Credit Only Granted for: ENCE633 or ENCE651.
Formerly: ENCE633.

ENCE652 Microbiological Principles of Environmental Engineering (3 Credits)
An examination of microbiological principles directly affecting humans and the surrounding environment. Special emphasis is given to the understanding of microbial physiology and in environmental engineering related to water and land systems including aerobic and anaerobic treatment processes involved in nutrient/waste recycling as well as impact of xenobiotic compounds on processes water, soil and sediment.
Credit Only Granted for: ENCE637 or ENCE652.
Formerly: ENCE637.

ENCE655 Environmental Behavior of Organic Pollutants (3 Credits)
Introduction to the scientific data needed and methods currently available to assess the environmental risk of organic chemicals. Applications of principles from chemical thermodynamics will be used to study phase-transfer processes of organic pollutants in the environment (solid/water, solid/air, water/air). Physical-chemical properties of organic pollutants will be used to estimate partitioning.
Prerequisite: ENCE651.

ENCE660 Principles of Disaster Management (3 Credits)
Covers the complexities and unique requirements that arise in preparing for, responding to, recovering from and mitigating against natural disasters. It focuses on what the Manager should know to handle pre- and post-disaster projects. The course introduces underlying policies, programs and emergency management protocols related to managing natural disasters. It translates the lexicons of emergency management to align with project management tools and processes. The course also explores the challenges of executing and delivering projects and programs during each phase of the emergency management cycle. The student will learn to build disaster-resilient concepts and emergency management into project management processes and be better equipped to contribute to a more sustainable and disaster-resilience future.

ENCE661 Project Cost Accounting and Finance (3 Credits)
This course reviews the fundamentals of accounting; examines project cost accounting principles, applications, and impact on profitability; examines the principles of activity based costing; covers the elements involved in cash management; introduces the framework for how projects are financed and the potential impact financing has on the projects; and a framework for evaluating PC based systems and what resources are needed for an effective project cost system.

ENCE662 Introduction to Project Management (3 Credits)
Introduction to project management including: overview and concepts of project management (principles, body of knowledge, strategies); planning successful projects (defining, specifying, delivery options, scheduling, budgeting); implementing (organizing the team, work assignments, team building, effective leadership); executing (performance measurement, maintaining the schedule, adjustments/mid-course corrections, record keeping, status reporting, communications, managing conflict, time management); and closeout(performance measurement, maintaining the schedule, adjustments/mid-course corrections, record keeping, status reporting, communications, managing conflict, time management).

ENCE664 Legal Aspects of Engineering Design and Construction (3 Credits)
Examines ways in which the legal system affects the design and construction process. Focuses on contract types and the relationships between the parties in different delivery systems. Covers basics of procurement protocols along with negotiating techniques and strategies. Topics include contract law, the relationships between the parties, tort and negligence law, and the statutory principles affecting construction.

ENCE665 Management of Project Teams (3 Credits)
Experience has shown that really excellent project managers are not only technically competent but that they have above average skills in human relations and communications. The course will prepare project managers to optimize the utilization of their most important resource: people. Relying primarily on a wide range of research and experience in the Project Team, this course will help guide project managers in building the other skills needed to be truly successful in the competitive Project Team.

ENCE666 Cost Engineering and Control (3 Credits)
Analytical techniques to estimate and control project costs, including site investigation, quantity takeoff, work analysis, and bid preparation. Systematic cost control as related to job production and historical data. Includes the fundamentals of different types of cost estimating, the appropriate use of each, and examination of popular software. This course is designed to help students develop the ability to utilize techniques of cost estimating, cost and schedule control and project management as they apply to engineering and construction work. Students will understand why it is crucial to understand the various types of cost estimating and the appropriate use of each, activity-based costing, conceptual estimating and budgeting, unit cost estimating, parametric estimating, detailed estimating, learning curves and progress functions.

ENCE670 Highway Traffic Characteristics and Measurements (3 Credits)
The study of the fundamental traits and behavior patterns of road users and their vehicles in traffic. The basic characteristics of the pedestrian, the driver, the vehicle, traffic volume and speed, stream flow and intersection operation, parking, and accidents.

ENCE672 Regional Transportation Planning (3 Credits)
Factors involved and the components of the process for planning statewide and regional transportation systems, encompassing all modes. Transportation planning studies, statewide traffic models, investment models, programming and scheduling.

ENCE673 Urban Transportation (3 Credits)
The contempory methodology of urban transportation planning. The urban transportation planning process, interdependence between the urban transportation system and the activity system, urban travel demand models, evaluation of urban transportation alternatives and their implementation.

ENCE674 Urban Transit Planning and Rail Transportation Engineering (3 Credits)
Basic engineering components of conventional and high speed railroads and of air cushion and other high speed new technology. The study of urban rail and bus transit. The characteristics of the vehicle, the supporting way, and the terminal requirements will be evaluated with respect to system performance, capacity, cost, and level of service.

ENCE675 Airport Planning and Design (3 Credits)
The planning and design of airports including site selection, runway configuration, geometric and structural design of the landing area, and terminal facilities. Methods of financing airports, estimates of aeronautical demand, air traffic control, and airport lighting are also studied.

ENCE676 Highway Traffic Flow Theory (3 Credits)
An examination of physical and statistical laws that are used to represent traffic flow phenomena. Deterministic models including heat flow, fluid flow, and energy-momentum analogies, car following models, and acceleration noise. Stochastic approaches using independent and Markov processes, Queuing models, and probability distributions.

ENCE677 OR Models for Transportation Systems Analysis (3 Credits)
Fundamental skills and concepts of the quantitative techniques of operations research including: mathematical modeling, linear programming, integer programming, network optimization (shortest paths, minimum spanning trees, minimum cost network flows, maximum flows), heuristics, and basics of probabilistic modeling. Emphasis on the application of these techniques to problems arising in transportation.

ENCE681 Freight Transportation Analysis (3 Credits)
Application of operations research and system analysis methods to freight transportation systems. Cost and output analysis, terminal location, freight transportation demand models, freight transportation network equilibrium models and analytic models for analyzing the operations of rail, motor carrier, water carrier and air cargo systems.

ENCE682 Innovations in Materials and Technologies for Future Civil Infrastructure (3 Credits)
The future of civil infrastructure depends on novel materials that are stronger, smarter, and more sustainable, as well as new construction technologies that are faster, more reliable, and less labor-intensive. This course explores the latest breakthroughs in civil engineering materials and technologies. Students will explore how cutting-edge materials and construction technologies are transforming the civil engineering practice. Through lectures, assignments, hands-on demonstrations, and projects, students gain the skills to innovate, design, and implement next-generation materials and technologies that help to tackle the urgent challenges in sustainable and digital civil infrastructure.
Jointly offered with: ENCE482.
Restriction: Permission of the ENGR-Civil and Environmental Engineering department.
Credit Only Granted for: ENCE482 or ENCE682.
Additional Information: Students must have prior coursework similar to the content offered in undergraduate course ENCE300.

ENCE688 Advanced Topics in Civil Engineering (1-3 Credits)
Advanced topics selected by the faculty from the current literature of civil engineering to suit the needs and background of students. May be taken for repeated credit when identified by topic title.

ENCE689 Seminar (1-16 Credits)

ENCE710 Steel Structures I (3 Credits)
Moment connections of beams and columns. Wind bracing connections. Plate girders. Floor systems for buildings. Strengthening of beams and trusses. Corrosion control. Fatigue and fracture.
Formerly: ENCE656.

ENCE713 Concrete Structures I (3 Credits)
The behavior and strength of reinforced concrete members under combined loadings, including the effects of creep, shrinkage and temperature. Mechanisms of shear resistance and design procedures for bond, shear and diagonal tension. Elastic and ultimate strength analysis and design of slabs. Columns in multistory frames. Applications to reinforced concrete structures.
Formerly: ENCE753.

ENCE715 Earthquake Engineering (3 Credits)
Review of SDOF and MDOF structural dynamics; characteristics of earthquakes; philosophies of seismic design; elastic and inelastic response spectra; design for ductility; principles of capacity design; design of structural systems requiring special performance criteria.
Restriction: Permission of instructor.
Formerly: ENCE755.

ENCE717 Bridge Structures (3 Credits)
The design and rating of bridge structures in accordance with the AASHTO WSD, LFD, ALFD, and LRFD specifications. Development of the basic strength and performance requirements as defined within AASHTO, area and various foreign codes. Projects requiring the design, rating and ultimate strength evaluations will be assigned for all of the predominate construction types including: simple and continuous span, straight and horizontally curved, non-composite and composite w and box section superstructure elements.
Formerly: ENCE751.

ENCE718 Advanced Structural Systems (3 Credits)
Review of classical determinate and indeterminate analysis technique; multistory buildings; space structures; suspension bridges and cables structures; arches; long span bridges.
Formerly: ENCE750.

ENCE721 Investment Theory for Project Engineers (3 Credits)
An introductory course covering investment theory and its application to project evaluation and selection. Selected topics include: basic theory of interest and fixed income securities; portfolio selection and modification; capital asset pricing; asset price dynamics; derivative securities; and project evaluation using real options.
Credit Only Granted for: ENCE652 or ENCE721.
Formerly: ENCE652.

ENCE722 Market, Spatial, and Traffic Equilibrium Models in Project Management (3 Credits)
Introduction to equilibrium models involving economics and engineering. Topics include: review of relevent optimization theory; the nonlinear complementary problem (NCP) and variational inequality problem formats to solve equilibrium problems; review of relevant game theory, equilibrium models, and algorithims.
Credit Only Granted for: ENCE654, ENCE688M, or ENCE722.
Formerly: ENCE654.

ENCE725 Probabilistic Optimization (3 Credits)
Provide an introduction to optimization under uncertainty. Chance-constrained programming, reliability programming, value of information, two stage problems with recourse, decomposition methods, nonlinear and linear programming theory, probability theory. The objectives of this course are to provide understanding for studying problems that involve optimization under uncertainty, learn about various stochastic programming formulations (chance constrained programs, two stage methods with recourse, etc.) relevant to engineering and economic settings, present theory for solutions to such problems, and present algorithms to solve these problems.Cross-listed with ENME725.
Credit Only Granted for: ENME725 or ENCE725.

ENCE730 Environmental and Water Resource Systems II (3 Credits)
Advanced topics in operational research. Applications to complex environmental and water resource systems. The use of systems simulation and probabalistic modeling.
Prerequisite: ENCE630; or permission of instructor.

ENCE741 Earth Retaining Structures (3 Credits)
Introduction to types and uses of earth retaining structures, and lateral earth pressure concepts and theories. Analysis and design of retaining walls and shoring structures and their bracing systems. These include conventional retaining walls, mechanically stabilized earth walls, cantilever and anchored sheet piling, cellular cofferdams, braced cuts, soil nailing, and the design of tiebacks and anchors. Load and resistance factor design concept will be presented.

ENCE743 Soil Dynamics and Earthquake Engineering (3 Credits)
Review of theory of vibration and wave propagation in elastic media. Field and laboratory methods for determining dynamic soil properties. Analysis and design of soil-foundation systems subjected to machinery generated vibrations and methods of foundation isolation. Earthquake causes, magnitude and intensity, seismic hazard evaluation, NEHRP site classification, site response analyses and ground motion amplification, liquefaction and response of earth structures.
Credit Only Granted for: ENCE642 or ENCE743.
Formerly: ENCE642.

ENCE744 QA/QC and Specification for Highway Materials (3 Credits)
Factorial Experiments and Analysis. Materials Variability Components: Inherent and Testing Variability. Quality Control/Quality Assurance: Analysis Methods, Assurance Plans and Components. Specifications for Asphalt and Concrete Materials: Method, End-Result, Performance Based. Life Cycle Analysis and Performance Modeling Techniques. Use of Advanced Statistical Analysis for Material Properties Monitoring and Performance Predictions: ANOVA, Time Series, Spatial Data Analysis. Advanced Highway Materials including Polymer Modified and High Performance Asphalt and Concrete.
Prerequisite: ENCE300.

ENCE751 Chemistry of Natural Waters II (3 Credits)
A continuation of ENCE651, introducing aquatic chemical kinetics and chemistry of the solid-water interface.
Prerequisite: ENCE650 and ENCE651.

ENCE799 Master's Thesis Research (1-6 Credits)

ENCE898 Pre-Candidacy Research (1-8 Credits)

ENCE899 Doctoral Dissertation Research (1-8 Credits)

ENEE - Electrical & Computer Engineering

ENEE407 Design & Testing of RF and Microwave Devices (2 Credits)
An introduction to state of the art design, and testing techniques of RF and microwave devices. Designs, simulations and layout of different devices are performed using the software package ADS (Advanced Design System). The course highlights a wide range of engineering applications including terrestrial microwave links, satellite communications, broadcasting, mobile communications and radar.
Prerequisite: Minimum grade of C- in ENEE381; and must have earned a minimum grade of regular (letter) C- in all required 200-level ENEE courses; and permission of ENGR-Electrical & Computer Engineering department.
Restriction: Must be in one of the following programs (Engineering: Computer; Engineering: Electrical) ; and permission of ENGR-Electrical & Computer Engineering department.

ENEE408 Capstone Design Project (3 Credits)
Culmination of prior course work in electrical and computer engineering. Utilization of modern design tools and methodologies for the design of components or systems under realistic constraints, with particular emphasis on teamwork and oral/written communication. Areas in which projects are currently offered include: microprocessor-based systems, digital systems, VLSI design (both digital and mixed-signal), and optical systems.
Prerequisite: Must have earned a minimum grade of regular (letter) C- in all required 200-level ENEE courses; and permission of ENGR-Electrical & Computer Engineering department.
Restriction: Must be in one of the following programs (Engineering: Computer; Engineering: Electrical).
Repeatable to: 6 credits if content differs.

ENEE411 Advanced Analog and Digital Electronics (3 Credits)
Examination of analog and digital device models for analysis, design, and simulation of transistor level electronic circuits, emphasizing Metal Oxide Silicon Field Effect Transistors (MOSFETs); fundamental single transistor configurations; frequency response, feedback, and stability of multi-transistor circuits, such as current mirrors, differential amplifiers, voltage references, operational amplifiers and data converters; complementary Metal Oxide Silicon (CMOS) implementations of static and clocked digital as well as mixed signal circuits.
Prerequisite: Minimum grade of C- in ENEE303 or ENEE304.
Restriction: Must be in one of the following programs (Engineering: Electrical; Engineering: Computer) ; and must have permission of the department.

ENEE413 Advanced Electronic Devices (3 Credits)
Advanced devices and their physical operation, providing a thorough description of those parts not usually covered in introductory electronics courses. These include Schottky and tunnel junctions, negative resistance devices used in wireless communication, homo-structure compound semiconductor transistors, hetero-structure (quantum effect) transistors, non-volatile memory devices, photonic devices such as LEDs and solid-state lasers, solar cells, photo-detectors and camera imagers, as well as bio-related components. Special consideration will be given to achieve an understanding of noise processes that limit electronic device performance. In all cases, system-level applications will be illustrated.
Prerequisite: Minimum grade of C- in ENEE313 or ENEE304.
Restriction: Must be in one of the following programs (Engineering: Computer; Engineering: Electrical) ; and permission of ENGR-Electrical & Computer Engineering department.

ENEE415 Advanced Manufacturing Laboratory (3 Credits)
An interdisciplinary course designed to provide students with an overview of key processes, technology, and manufacturing techniques involved in fabricating advanced devices and systems. Students will be exposed to state-of-the-art fabrication technologies, including soft lithography, 3D printing, hybrid manufacturing, material functionalization, and systems integration. In addition to developing a theoretical understanding in the classroom, students will gain hands-on fabrication and characterization experience of systems that can interface with complex environments.
Prerequisite: ENEE313 or ENEE304.
Restriction: Must be in the Department of Electrical and Computer Engineering.
Credit Only Granted for: ENEE415, ENEE419M, ENMA489M, or BIOE489J..
Formerly: ENEE419M.

ENEE416 Integrated Circuit Fabrication Laboratory (3 Credits)
Characterization of wafers and fabrication steps. Oxide growth, lithography, dopant diffusion, and metal deposition and patterning will be discussed in the lectures and carried out in the lab in fabricating NMOS transistor circuits. The transistor characteristics will be measured and related to the fabrication parameters.
Prerequisite: Minimum grade of C- in ENEE303 or ENEE304; and must have earned a minimum grade of regular (letter) C- in all required 200-level ENEE courses.
Restriction: Must be in one of the following programs (Engineering: Computer; Engineering: Electrical), and permission of ENGR-Electrical & Computer Engineering department.

ENEE417 Microelectronics Design Laboratory (2 Credits)
Students design and build fairly sophisticated circuits, mainly composed of discrete transistors and integrated circuits. Many of the projects are designed to require that students synthesize from what they have learned in many of the disciplines in electrical engineering. Students learn they can actually use their knowledge to build something very practical, which may include a high-fidelity amplifier, a radio, a memory cell, a transmitter, etc.
Prerequisite: Minimum grade of C- in ENEE303; and minimum grade of C- in ENEE307; and must have earned a minimum grade of regular (letter) C- in all required 200-level ENEE courses; and permission of ENGR-Electrical & Computer Engineering department.
Restriction: Must be in one of the following programs (Engineering: Electrical; Engineering: Computer).

ENEE419 Topics in Microelectronics (1-3 Credits)
Selected topics of current importance in microelectronics.
Prerequisite: Permission of ENGR-Electrical & Computer Engineering department; and completion of all lower-division technical courses in the EE curriculum.
Restriction: Must be in one of the following programs (Engineering: Electrical; Engineering: Computer).
Repeatable to: 99 credits if content differs.

ENEE420 Communication Systems (3 Credits)
Fourier series, Fourier transforms and linear system analysis; random signals, autocorrelation functions and power spectral densities; analog communication systems: amplitude modulation, single-sideband modulation, frequency and phase modulation, sampling theorem and pulse-amplitude modulation; digital communication systems pulse-code modulation, phase-shift keying, differential phase shift keying, frequency shift keying; performance of analog and digital communication systems in the presence of noise.
Prerequisite: Minimum grade of C- in ENEE322 or ENEE323; and minimum grade of C- in ENEE324; and completion of all lower-division technical courses in the Electrical Engineering curriculum.
Restriction: Must be in one of the following programs (Engineering: Computer; Engineering: Electrical), and permission of ENGR-Electrical & Computer Engineering department.

ENEE425 Digital Signal Processing (3 Credits)
Sampling as a modulation process; aliasing; the sampling theorem; the Z-transform and discrete-time system analysis; direct and computer-aided design of recursive and nonrecursive digital filters; the Discrete Fourier Transform (DFT) and Fast Fourier Transform (FFT); digital filtering using the FFT; analog-to-digital and digital-to analog conversion; effects of quantization and finite-word-length arithmetic.
Prerequisite: Minimum grade of C- in ENEE322 or ENEE323.
Restriction: Must be in one of the following programs (Engineering: Computer; Engineering: Electrical), and permission of ENGR-Electrical & Computer Engineering department.

ENEE426 Communication Networks (3 Credits)
The main design issues associated with computer networks, satellite systems, radio nets, and general communication networks. Application of analytical tools of queuing theory to design problems in such networks. Review of proposed architectures and protocols.
Prerequisite: ENEE324 or STAT400; and completion of all lower-division technical courses in the EE curriculum.
Restriction: Must be in Engineering: Computer or Engineering: Electrical program.
Credit Only Granted for: CMSC417 or ENEE426.

ENEE427 Communications Design Laboratory (2 Credits)
Advanced Laboratory course exploring signal processing and communication systems theoretical concepts and implementing them on actual DSP based hardware in real time.
Prerequisite: Minimum grade of C- in ENEE322 or ENEE323; and minimum grade of C- in ENEE324 or STAT400; and completion of all lower-division technical courses in the EE curriculum.
Recommended: ENEE420 and ENEE425.
Restriction: Must be in Engineering: Electrical or Engineering: Computer program; and permission of Electrical and Computing Engineering Department.
Credit Only Granted for: ENEE427 or ENEE428.
Formerly: ENEE428.

ENEE429 Topics in Communications (1-3 Credits)
Selected topics of current importance in communications.
Prerequisite: Permission of ENGR-Electrical & Computer Engineering department; and completion of all lower-division technical courses in the EE curriculum.
Restriction: Must be in one of the following programs (Engineering: Electrical; Engineering: Computer).
Repeatable to: 99 credits if content differs.

ENEE435 Quantum Information Processing (3 Credits)
Basics of linear algebra and probability theory used in quantum information processing. Quantum gates and their applications. Quantum computations and algorithms. Quantum cryptography, covering the Bennett-Brassard and Eckert key distribution protocols. Quantum error correction, examples of stabilizer codes.
Prerequisite: Minimum grade of B- in MATH240, MATH461, ENEE290, or PHYS 274; and minimum grade of C- in ENEE491 or equivalent .
Recommended: ENEE324 or STAT400.
Restriction: Must be in one of the following programs (Engineering: Electrical; Engineering: Computer); and must be in the Quantum Science and Engineering minor.
Additional Information: ECE students not in the minor should contact their ECE advisor or email eceadvise@umd.edu for assistance.

ENEE436 Foundations of Machine Learning (3 Credits)
A broad introduction to the foundations of Machine Learning (ML), as well as hands-on experience in applying ML algorithms to real-world data sets. Topics include various techniques in supervised and unsupervised learning, as well as applications to computer vision, data mining, and speech recognition.
Prerequisite: 1 course with a minimum grade of C- from (ENEE324, STAT400); and 1 course with a minimum grade of C- from (ENEE150, CMSC216); and permission of ENGR-Electrical & Computer Engineering department.
Restriction: Permission of ENGR-Electrical & Computer Engineering department. And must be in one of the following programs (Engineering: Electrical; Engineering: Computer) ; or must be in the ECE Department's Machine Learning notation program.
Credit Only Granted for: ENEE436, ENEE439M, or CMSC422.
Formerly: ENEE439M.

ENEE439 Topics in Signal Processing (1-3 Credits)
Selected topics of current importance in signal processing.
Prerequisite: Permission of ENGR-Electrical & Computer Engineering department; and completion of all lower division technical courses in the EE curriculum.
Restriction: Must be in one of the following programs (Engineering: Computer; Engineering: Electrical).
Repeatable to: 99 credits if content differs.

ENEE440 Microprocessors (3 Credits)
Microprocessor architectures, instruction sets, and applications. Bus structures, memory, I/O interfacing. Assembly language programming, LSI device configuration, and the embedding of microprocessors in systems.
Prerequisite: ENEE350; and completion of all lower division technical courses in the EE curriculum.
Restriction: Must be in one of the following programs (Engineering: Computer; Engineering: Electrical).

ENEE445 Computer Laboratory (2 Credits)
This laboratory course focuses on the hardware/software interface in computer systems. Hands-on experiments are used to teach design, construction, analysis, and measurement of both hardware and software for embedded systems. Projects emphasize using microcontrollers for control, sensing, and communication through various I/O devices.
Prerequisite: Minimum grade of C- in ENEE205 and ENEE350.
Restriction: Must be in one of the following programs (Engineering: Computer; Engineering: Electrical); and permission of ENGR-Electrical & Computer Engineering department.

ENEE446 Digital Computer Design (3 Credits)
Hardware design of digital computers. Arithmetic and logic units, adders, multipliers and dividers. Floating-point arithmetic units. Bus and register structures. Control units, both hardwired and microprogrammed. Index registers, stacks, and other addressing schemes. Interrupts, DMA and interfacing.
Prerequisite: ENEE350; and completion of all lower-division technical courses in the EE curriculum.
Restriction: Permission of ENGR-Electrical & Computer Engineering department.
Credit Only Granted for: ENEE446 or CMSC411.

ENEE447 Operating Systems (4 Credits)
The course will present the theory, design, implementation and analysis of computer operating systems. Through classroom lectures, homework, and projects, students learn the fundamentals of concurrency, process management, interprocess communication and synchronization, job scheduling algorithms, memory management, input-output devices, file systems, and protection and security in operating systems. Optional topics may include communications protocols, computer security, and real-time operating systems. The lectures will be complemented with a significant level of programming, bringing up a simple operating system from scratch, concurrently as the topics are discussed in lecture. A weekly recitation section will provide TA support and an informal laboratory atmosphere. Each student will have their own board, so development will be done largely outside the classroom at each student's pace.
Prerequisite: 1 course with a minimum grade of C- from (CMSC414, CMSC417, CMSC420, CMSC430, CMSC433, CMSC435, ENEE440, ENEE457); and permission of ENGR-Electrical & Computer Engineering department; and (ENEE350, CMSC330, and CMSC351).
Restriction: Must be in Engineering: Computer program; and permission of ENGR-Electrical & Computer Engineering department.
Credit Only Granted for: ENEE447 or CMSC412.

ENEE452 Embedded Systems (3 Credits)
Embedded systems are part of most of the modern technological systems such as Industrial machines, consumer electronics, agricultural and process industry devices, automobiles, medical equipment, cameras, household appliances, airplanes, vending machines and toys, as well as mobile devices. Embedded systems are comprised of hardware, software and firmware. Design Methodologies and platforms for real time modern embedded digital systems have been evolving over time. In order to meet the system specifications, many models, tools, and operating systems exist to automate the design space exploration phase. In this course, students will be introduced to microcontroller-based embedded system design, fundamental concepts of a Real Time Operating System (RTOS), and the design of solutions for the Internet of Things (IOT). Using hands-on experience developed through practical designs, exercises, and projects, we will discuss in detail how to analyze, implement, and synthesize these systems.
Prerequisite: Minimum grade of C- in ENEE350 and ENEE244; and minimum grade of C- in ENEE150 or CMSC216.
Restriction: Permission of the Electrical and Computer Engineering Department; and must be in one of the following programs (Engineering: Computer; Engineering: Electrical).
Credit Only Granted for: ENEE452 or ENEE459V.
Formerly: ENEE459V.

ENEE456 Cryptography (3 Credits)
The theory, application, and implementation of mathematical techniques used to secure modern communications. Topics include symmetric and public-key encryption, message integrity, hash functions, block-cipher design and analysis, number theory, and digital signatures.
Prerequisite: (CMSC106, CMSC131, or ENEE150; or equivalent programming experience); and (2 courses from (CMSC330, CMSC351, ENEE324, or ENEE382); or any one of these courses and a 400-level MATH course, or two 400-level MATH courses); and Permission of CMNS-Mathematics department or permission of instructor.
Cross-listed with: MATH456, CMSC456.
Credit Only Granted for: MATH456, CMSC456 or ENEE456.

ENEE457 Computer Systems Security (3 Credits)
Theoretical and practical aspects of computer systems security. Topics covered include symmetric/asymmetric encryption, message authentication, digital signatures, access control, as well as network security, web security and cloud security. Students acquire tools necessary for designing secure computer systems and programs and for defending against malicious threats (e.g., viruses, worms, denial of service).
Prerequisite: Minimum grade of C- in ENEE350; and permission of ENGR-Electrical & Computer Engineering department.
Restriction: Must be in one of the following programs (Engineering: Electrical; Engineering: Computer) ; and permission of ENGR-Electrical & Computer Engineering department.
Credit Only Granted for: CMSC414 or ENEE457.

ENEE459 Topics in Computer Engineering (1-3 Credits)
Selected topics of current importance in computer engineering.
Prerequisite: Permission of ENGR-Electrical & Computer Engineering department; and completion of all lower-division technical courses in the EE curriculum.
Restriction: Must be in one of the following programs (Engineering: Computer; Engineering: Electrical).
Repeatable to: 99 credits if content differs.

ENEE460 Control Systems (3 Credits)
Mathematical models for control system components. Transform and time domain methods for linear control systems. Introductory stability theory. Root locus, bode diagrams and Nyquist plots. Design specifications in the time and frequency domains. Compensation design in the time and frequency domain. Introduction to sampled data systems.
Prerequisite: ENEE322; and (ENEE290, MATH240, or MATH461); and completion of all lower-division technical courses in the EE curriculum.
Restriction: Must be in one of the following programs (Engineering: Computer; Engineering: Electrical).

ENEE461 Control Systems Laboratory (3 Credits)
Students will design, implement, and test controllers for a variety of systems. This will enhance their understanding of feedback control and familiarize them with the characteristics and limitations of real control devices. They will also complete a small project. This will entail writing a proposal, purchasing parts for their controller, building the system, testing it, and writing a final report describing what they have done.
Prerequisite: Minimum grade of C- in ENEE205; and minimum grade of C- in ENEE322 or ENEE323.
Restriction: Must be in one of the following programs (Engineering: Computer; Engineering: Electrical); and permission of ENGR-Electrical & Computer Engineering department.
Credit Only Granted for: ENEE461, ENME461, or ENME489N.

ENEE463 Digital Control Systems (3 Credits)
Introduction to techniques for the analysis and design of linear control systems and implementation of control systems using digital technology. Topics include linearization, solution of linear equations, z-transforms and Laplace transforms, design of linear controllers, optimal control, and digital implementation of control designs. Students will use MATLAB for the solution of problems and the design of control systems.
Prerequisite: Minimum grade of C- in ENEE322 or ENEE323.
Restriction: Must be in one of the following programs (Engineering: Computer; Engineering: Electrical), and permission of ENGR-Electrical & Computer Engineering department.

ENEE464 Introduction to Optimization (3 Credits)
Students will be introduced to linear, nonlinear, unconstrained, constrained optimization. Convex optimization will be highlighted. Applications will be considered, in particular in the area of machine learning. Some optimization algorithms may be discussed, time permitting.
Prerequisite: One of the following: ENEE290, MATH240, MATH341, or MATH461; and must have completed or be concurrently enrolled in ENEE324 or STAT400.
Recommended: Experience in Matlab or Python.
Restriction: Must be in the Department of Electrical and Computer Engineering; and must have permission of ENGR-Electrical & Computer Engineering department.
Credit Only Granted for: ENEE464 or ENEE469O.
Formerly: ENEE469O.

ENEE467 Robotics Project Laboratory (3 Credits)
Teaches practical skills to build, control, and deploy robotic systems. Interdisciplinary groups of students develop real-world robotic systems, with emphasis on making a real robot do what one wants it to do.
Prerequisite: Minimum grade of C- in ENAE450.
Restriction: Must be in the Robotics and Autonomous Systems minor; and permission of Department of Electrical and Computer Engineering.

ENEE469 Topics in Controls (1-3 Credits)
Selected topics of current importance in controls.
Prerequisite: Permission of ENGR-Electrical & Computer Engineering department; and completion of all lower-division technical courses in the EE curriculum.
Repeatable to: 99 credits if content differs.

ENEE473 Electrical Machines Laboratory (2 Credits)
Students will learn theory and measurement methods of passive power components, multi-phase AC power, single and three-phase transformers, single and three-phase induction machines, three-phase synchronous machines, and DC machines. Each of these topics is addressed in one or more laboratory exercises.
Prerequisite: Minimum grade of C- in ENEE205; and must have earned a minimum grade of regular (letter) C- in all required 200-level ENEE courses.
Recommended: ENEE322 or ENEE323.
Restriction: Permission of the Electrical and Computer Engineering Department.

ENEE474 Power Systems (3 Credits)
Interconnected power systems, transmission lines, load flow studies, unit commitment and economic dispatch. Three phase networks, machine models. Symmetrical components, fault analysis and unbalanced operation. Power system transients, stability and numerical methods in power system analysis.
Prerequisite: Minimum grade of C- in ENEE322 or ENEE323.
Restriction: Must be in one of the following programs (Engineering: Computer; Engineering: Electrical), and permission of ENGR-Electrical & Computer Engineering department.

ENEE475 Power Electronics (3 Credits)
This course is suitable for undergraduate and graduate students who want to learn the basic principles of power electronics and its applications. Special emphasis is placed on the interdisciplinary nature of power electronics. Strong and intimate connections between power electronics and circuit theory, electronic circuits, semiconductor devices, electric power, magnetic, motor drives and control are stressed.
Prerequisite: Minimum grade of C- in ENEE303 or ENEE304.
Restriction: Must be in one of the following programs (Engineering: Electrical; Engineering: Computer); and permission of ENGR-Electrical & Computer Engineering department.

ENEE476 Renewable Energy (3 Credits)
Solar Energy Conversion Systems: History of Photovoltaic (PV) Systems, PV Cell, Module and Array Models and Equivalent Circuits, Characteristic Resistance, Fill Factor, Effects of Parasitic Resistances, Mismatch Effects, Shading, Bypass Diodes, Sun Tracking Systems, Maximum Power Point Tracking (MPPT) Techniques, Isolated and Non-isolated Switch-mode DC/DC for PV Systems, Inverter Design and Control, Sizing the PV Panel and Battery Pack in PV Applications. Wind Energy Conversion Systems: Introduction to Wind Energy Harvesting, Horizontal and Vertical Wind Systems, Fundamentals of Wind Energy Harvesting Systems, Variable Speed and Fixed Speed Wind Energy Conversion Systems (WECS), Wind Turbines and Different Electrical Machines in Wind Applications, Induction Machine and Dynamic Model of Induction Machines, Synchronous Generators and Dynamic Model of SG, Control of Wind Energy Conversion Systems.
Prerequisite: Minimum grade of C- in ENEE303 or ENEE304.
Restriction: Must be in one of the following programs (Engineering: Computer; Engineering: Electrical), and permission of ENGR-Electrical & Computer Engineering department.

ENEE484 Optoelectronic Devices (3 Credits)
Explores the fundamental physics of optoelectronic devices including lasers, solar cells, LEDs, and photodetectors. We aim at an understanding of the fundamental principles on device physics, material considerations, and significant components of optoelectronic devices. State-of-the-art device configurations and material choices in industry and academia will be discussed.
Recommended: A background in semiconductors and P-N junctions.
Restriction: Permission of the Electrical and Computer Engineering Department.
Credit Only Granted for: ENEE484 or ENEE489I.
Formerly: ENEE489I.

ENEE486 Optoelectronics Lab (2 Credits)
Hands-on experience in performing measurements in optics and electro-optics. Basics of optics, light detectors, Fourier optics, gratings and spectrometers, pulsed dye lasers, fiber optics, electro-optics, and acousto-optics.
Prerequisite: Minimum grade of C- in ENEE205; or minimum grade of C- in ENEE206. And minimum grade of C- in PHYS271 and PHYS270; and must have earned a minimum grade of regular (letter) C- in all required 200-level ENEE courses; and permission of ENGR-Electrical & Computer Engineering department.
Restriction: Must be in one of the following programs (Engineering: Computer; Engineering: Electrical).

ENEE488 Independent Study in Electrical and Computer Engineering (1-3 Credits)
The purpose is to provide students with an opportunity for independent study projects on advanced electrical and computer engineering topics. These projects typically involve academic investigations of technical themes that are not addressed in the established elective and special topics courses taught by the department on a regular basis. Study plans are tailored to students educational goals but are approved and supervised by faculty.
Prerequisite: Must have completed and earned a minimum grade of regular (letter) C- in all lower-division EE or CP tech electives; and permission of ENGR-Electrical & Computer Engineering department.
Restriction: Must be in one of the following programs (Engineering: Computer; Engineering: Electrical).
Repeatable to: 9 credits if content differs.
Additional Information: A total of 5 credits combined of ENEE488 and ENEE499 can count towards a degree in electrical and computer engineering.

ENEE489 Topics in Electrophysics (1-3 Credits)
Selected topics of current importance in electrophysics.
Prerequisite: Permission of ENGR-Electrical & Computer Engineering department; and completion of all lower-division technical courses in the EE curriculum.
Restriction: Must be in one of the following programs (Engineering: Computer; Engineering: Electrical).
Repeatable to: 99 credits if content differs.

ENEE490 Physical Principles of Wireless Communications (3 Credits)
This course is intended to give students an overall understanding of the physical phenomena involved in wireless communications and to allow them to make first-cut designs. Major topics covered include antennas, antenna arrays, radiowave scattering and propagation, noise sources in communications systems, cell phone systems and satcom.
Prerequisite: ENEE381.
Restriction: Must be in one of the following programs (Engineering: Computer; Engineering: Electrical).

ENEE491 Quantum Phenomena in Electrical Engineering (3 Credits)
Wave phenomena, wave-particle duality and laws of quantum mechanics. States, observables, operators and measurement, as applied to simple quantum circuits, information transmission and quantum key distribution. Also, covered: Schrodinger's equation, bound states, tunneling, scattering, periodic potentials, superconductivity and Josephson junctions.
Prerequisite: Minimum grade of C- in PHYS270, ENEE205 and (ENEE290 or MATH461).
Restriction: Permission of Electrical and Computer Engineering Department.
Credit Only Granted for: ENEE491 or ENEE489Q.
Formerly: ENEE489Q.

ENEE492 Introduction to Quantum Technology (3 Credits)
Investigates the basic concepts/building blocks of quantum computers, quantum key distribution, quantum networks, and quantum sensors. Examines what is needed to form a working qubit and different hardware platforms that implement them (for example, trapped ions, superconducting microwave circuits, color centers, and neutral atoms.) Conceptual and computational familiarity with complex numbers, vector spaces, bases, matrices, eigenvectors, and eigenvalues will be assumed, as well as quantum states/wave functions, and quantum measurement. Familiarity with spin-1/2 systems, and Pauli matrices is highly recommended.
Prerequisite: MATH141 and MATH240 or equivalent; and one of the following: PHYS360, PHYS401, PHYS457, CMSC457, or ENEE491; or permission of instructor.
Cross-listed with: PHYS467.
Credit Only Granted for: PHYS467 or ENEE492.

ENEE493 Quantum Hardware Laboratory (3 Credits)
The purpose of this lab course is to provide hands on experience for the students in working with experimental hardware and techniques which are used in research in the field of quantum computing, quantum communications and quantum sensors.
Prerequisite: Minimum grade of C- in one of the following courses: ENEE491, ENMA434, PHYS360, or PHYS401.
Restriction: Must be in the Quantum Science and Engineering minor; or have permission from the ECE department; and permission of Department of Electrical and Computer Engineering.

ENEE496 Lasers and Electro-optic Devices (3 Credits)
Modern physical optics: Gaussian beams, optical resonators, optical waveguides; theory of laser oscillation, rate equations; common laser systems. Selected modern optoelectronic devices like detectors and modulators. Role of lasers and optoelectronics in modern technology.
Prerequisite: ENEE381; and completion of all lower-division technical courses in the EE curriculum.
Restriction: Must be in one of the following programs (Engineering: Computer; Engineering: Electrical).

ENEE498 Topics in Electrical Engineering (1-3 Credits)
Selected topics of current importance in electrical engineering.
Prerequisite: Permission of ENGR-Electrical & Computer Engineering department; and completion of all lower-division technical courses in the EE curriculum.
Restriction: Must be in Engineering: Electrical program.
Repeatable to: 12 credits if content differs.

ENEE499 Senior Projects in Electrical and Computer Engineering (1-6 Credits)
The purpose is to provide students with an opportunity to engage in independent research projects on advanced electrical and computer engineering topics. Projects are selected by students and supervised by faculty and other qualified mentors. While students may be required to acquire new skills or information in the course of completing a 499 project, the focus is to conduct an independent investigation of a technical theme by the student. The project may be used to satisfy the advanced lab requirement if it is approved as a primarily experimental research project. In that case, the student will enroll in ENEE499L.
Prerequisite: Completion of all lower-division technical courses in the electrical or computer engineering curriculum.
Restriction: Permission of ENGR-Electrical & Computer Engineering department.
Repeatable to: 6 credits if content differs.
Additional Information: For students in the ECE Honors Program, a total of 6 credits combined of ENEE488 and ENEE499/499L can count toward a degree in electrical or computer engineering. For non-honors ECE students, a total of 5 credits combined of ENEE488 and ENEE499/499L can count toward a degree in electrical or computer engineering.

ENEE600 Solid State Electronics (3 Credits)
Properties of crystals; energy bands: electron transport theory; conductivity and hall effect; statistical distributions; fermi level: impurities; non-equilibrium carrier distributions; normal modes of lattice vibration and thermal properties of crystals; tunneling phenomena; surface properties.
Prerequisite: ENEE413; and must have background in elementary quantum mechanics.
Credit Only Granted for: ENEE600 or ENEE793.
Formerly: ENEE793.

ENEE601 Semiconductor Devices and Technology (3 Credits)
The principles, structures and characteristics of semiconductor devices. Technology and fabrication of semiconductor devices.
Recommended: ENEE413 and ENEE600.
Credit Only Granted for: ENEE601 or ENEE697.
Formerly: ENEE697.

ENEE605 Design and Fabrication of Micro-Electro-Mechanical Systems (MEMS) (3 Credits)
The goals are to explore the world of Micro-Electro-Mechanical Systems (MEMS) by understanding its design and fabrication aspects.
Credit Only Granted for: ENEE605 or ENEE719R.
Formerly: ENEE719R.

ENEE610 Electrical Network Theory (3 Credits)
Matrix algebra, network elements, ports, passivity and activity, geometrical and analytical descriptions of networks, state variable characterizations, scattering matrices, signal flow graphs, sensitivity.
Prerequisite: Must have completed undergraduate-level Circuit Theory; or permission of instructor.

ENEE611 Integrated Circuit Design and Analysis (3 Credits)
Active and passive elements used in semiconductor structures. Design application of linear and digital integrated circuits.
Recommended: ENEE610.
Credit Only Granted for: ENEE611 or ENEE696.
Formerly: ENEE696.

ENEE612 Advanced Power Electronics (3 Credits)
Advanced power electronic converters, techniques to model and control switching circuits, pulse width modulation, resonant switch converters, resonant DC-link converters, series and parallel loaded resonant (SLR, PLR) DC-DC converters, zero voltage switching clamped-voltage (ZVS-CV) converters, ZVS resonant-switch DC-DC converters are explained. In addition, this course deals with small-signal and large-signal modeling and control of switched mode power converters, sliding-mode operation, state space models, generalized state-space averaging, and feedback linearization techniques. Multiple-input converters and their operational principles are explained. Furthermore, practical design procedures for type II and type III compensators with voltage-mode error-amplifier for DC/DC converters are explained.
Prerequisite: ENEE303, ENEE475, or ENEE476; or students who have taken courses with comparable content may contact the department.
Credit Only Granted for: ENEE719B or ENEE612.
Formerly: ENEE719B.

ENEE614 Radio Frequency VLSI Circuit Design (3 Credits)
This course will give students the knowledge required to analyze, design and lay-out discrete and integrated circuits used in modern radio frequency communications. The course will focus on advanced amplifier concepts, frequency conversion, tuning, and low-noise techniques. Implementation of AM, FM and digital modulation techniques will be covered. Emphasis will be given to CMOS technology as applied to analog VLSI. Advanced applications of SPICE and VLSI design layout tools will be covered.
Recommended: ENEE611.

ENEE620 Random Processes in Communication and Control (3 Credits)
Introduction to random processes: characterization, classification, representation; Gaussian and other examples. Linear operations on random processes, stationary processes: covariance function and spectral density. Linear least square waveform estimating Wiener-Kolmogroff filtering, Kalman-Bucy recursive filtering: function space characterization, non-linear operations on random processes.
Prerequisite: ENEE324; or students who have taken courses with comparable content may contact the department.

ENEE621 Estimation and Detection Theory (3 Credits)
Estimation of unknown parameters, Cramer-Rao lower bound; optimum (map) demodulation; filtering, amplitude and angle modulation, comparison with conventional systems; statistical decision theory Bayes, minimax, Neyman/Pearson, Criteria-68 simple and composite hypotheses; application to coherent and incoherent signal detection; M-ary hypotheses; application to uncoded and coded digital communication systems.
Prerequisite: ENEE620; or students who have taken courses with comparable content may contact the department.

ENEE623 Digital Communications (3 Credits)
Review of sampling and quantization, functional characterization of digital signals and transmission facilities, band-limited signals and systems. Digital modulation/demodulation techniques, error probability, intersymbol interference and its effects, adaptive equalization. Signaling with coded waveforms, fading and satellite channels, multiple access problems and protocols. Introduction to spread-spectrum Communications.
Recommended: ENEE420.

ENEE625 Multi-user Communication (3 Credits)
Basic queueing models. Store-and forward communications networks; switching modes; delay-throughput measures; capacity assignment; routing; topological design; computational aspects; flow control; error control; protocols; specification and validation; local networks; satellite and packet radio systems; multiple access schemes; stability and performance; multi-user information theory; and large scale system theory.
Prerequisite: ENEE620.

ENEE626 Error Correcting Codes (3 Credits)
Introduction to linear codes; bounds on the error correction capabilities of codes; convolutional codes with threshold, sequential and viterbi decoding; cyclic random error correcting codes; P-N sequences; cyclic and convolutional burst error correcting codes.
Prerequisite: ENEE420; or students who have taken courses with comparable content may contact the department.
Credit Only Granted for: ENEE626 or ENEE722.
Formerly: ENEE722.

ENEE627 Information Theory (3 Credits)
Information measures and their properties; entropy, relative entropy and mutual information. Information source models. Lossless data compression: the Kraft inequality, Shannon-Fano and Huffman codes. Typical sequences, asymptotic equipartition property, lossy source coding. Discrete memoryless channels: capacity, channel coding theorem. The additive Gaussian channel. Source coding under a fidelity constraint: rate distortion function and rate distortion theorem.
Prerequisite: ENEE620.
Credit Only Granted for: ENEE627 or ENEE721.
Formerly: ENEE721.

ENEE630 Advanced Digital Signal Processing (3 Credits)
This is the first-year graduate course in signal processing. The objective is to establish fundamental concepts of signal processing on multirate processing, parametric modeling, linear prediction theory, modern spectral estimation, and high-resolution techniques.
Prerequisite: ENEE425.
Corequisite: ENEE620.
Credit Only Granted for: ENEE624 or ENEE630.
Formerly: ENEE624.

ENEE631 Digital Image and Video Processing (3 Credits)
Foundations of digital image and video processing. Topics covered: 2-D systems and transforms; image acquisition and perception; multi-dimensional sampling; quantization; linear and non-linear techniques for image enhancement and restoration; basics on image analysis; lossless and lossy image compression; motion estimation and compensation; still image and video coding standards; applications of image and video processing.
Prerequisite: ENEE620 and ENEE630; or students who have taken courses with comparable content may contact the department.

ENEE632 Speech and Audio Processing (3 Credits)
The objective is to apply digital signal processing techniques to speech and music signals. Topics covered include acoustic theory of speech production leading to the source-filter model; acoustic and digital vocal-tract models of speech production; speech analysis-synthesis based on the short-time Fourier transform, linear prediction, and homomorphic representations; extensions to other multiresolution analysis; time-domain models for speech processing; auditory perception and speech perception; waveform and model-based speech coding using scalar and vector quantization; time-scale modification; pitch and formant estimation; application of techniques to music analysis-synthesis.
Prerequisite: ENEE620 and ENEE630.
Credit Only Granted for: ENEE739A or ENEE632.
Formerly: ENEE739A.

ENEE633 Statistical Pattern Recognition (3 Credits)
The goal is to introduce mathematical pattern analysis and recognition. Emphasis is given to parametric and non-parametric statistical pattern recognition methods and clustering with applications to speech, image and video recognition.
Prerequisite: MATH461; or students who have taken courses with comparable content may contact the department; or permission of instructor.
Corequisite: ENEE620; or permission of instructor.
Credit Only Granted for: ENEE633 or ENEE739Q.
Formerly: ENEE739Q.

ENEE634 Learning and Statistical Signal Processing (3 Credits)
Adaptive learning and statistical signal processing, including: numerical analysis; principal component analysis and support vector machines; adaptive signal processing (supervised learning); blind equalization and identification (unsupervised learning); antenna array and MIMO signal processing; space-time and space-time-frequency coding; neural networks (nonlinear adaptive learning); advanced topics on machine learning, such as online and deep learning.
Prerequisite: ENEE620 and ENEE630.

ENEE640 Digital CMOS VLSI Design (3 Credits)
Review of MOS transistors: fabrication, layout, characterization; CMOS circuit and logic design: circuit and logic simulation, fully complementary CMOS logic, pseudo-nMOS logic, dynamic CMOS logic, pass-transistor logic, clocking strategies; sub system design: ALUs, multipliers, memories, PLAs; architecture design: datapath, floorplanning, iterative cellular arrays, systolic arrays; VLSI algorithms; chip design and test: full custom design of chips, possible chip fabrication by MOSIS and subsequent chip testing.
Prerequisite: ENEE303 and ENEE350; or students who have taken courses with comparable content may contact the department; or permission of instructor.

ENEE641 Mathematical Foundations for Computer Engineering (3 Credits)
Mathematical modeling, design, analysis and proof techniques related to computer engineering. Probability, logic, combinatorics, set theory, and graph theory, as they pertain to the design and performance of computer engineering systems. Techniques for the design and analysis of efficient computational methods from graph theory and networks. Understanding of the limits on the efficiency of such computational methods. Translation from mathematical theory to actual programming. The course emphasizes mathematical rigor.
Credit Only Granted for: ENEE641 or ENEE759F.
Formerly: ENEE759F.

ENEE644 Computer-Aided Design of Digital Systems (3 Credits)
Design methodologies for digital systems using a modern hardware description language. Algorithmic, architectural and implementation aspects of arithmetic processing elements. Design of Complex Instruction Set (CISC), Reduced Instruction Set (RISC), and floating point processors. Synthesis, simulation and testing of processors with computer-aided design tools. Students in some sections may, on permission, fabricate VLSI chips via MOSIS.

ENEE645 Compilers and Optimization (3 Credits)
The compilation, linking and loading process. Using lexical analyzers and parsers. Intermediate forms. Global, stack and heap objects, and their addressing modes. Stack implementation. Control flow analysis and optimization. Dataflow analysis and optimization including Static, single assignment. Alias analysis.
Prerequisite: ENEE350 or CMSC216; or students who have taken courses with comparable content may contact the department.
Credit Only Granted for: ENPM808T, ENEE645, or ENPM617.

ENEE646 Digital Computer Design (3 Credits)
Concepts and techniques for design of computer systems with improved performance. Advanced I/O systems, memory organization, pipeland and parallel processors, bus bandwidth, processor/memory interconnections, cache memory, virtual memory, multiprocessors, performance evaluation.
Prerequisite: ENEE446; or students who have taken courses with comparable content may contact the department.

ENEE648 Advanced Topics in Electrical Engineering (3 Credits)
Every semester courses intended for a high degree of specialization are offered by visiting or regular electrical engineering faculty members in two or more of the areas listed in 488. The student should check with the electrical engineering office of graduate studies for a list and the description of the topics offered currently.
Repeatable to: 99 credits if content differs.

ENEE651 Parallel Algorithms (3 Credits)
A presentation of the theory of parallel computers and parallel processing. Models of parallel processing and the relationships between these models. Techniques for the design and analysis of efficient parallel algorithms including parallel prefix, searching, sorting, graph problems, and algebraic problems. Theoretical limits of parallelism.
Prerequisite: CMSC451; or ENEE641; or students who have taken courses with comparable content may contact the department.
Cross-listed with: CMSC751.
Credit Only Granted for: ENEE459P, ENEE651, ENEE759K or CMSC751.
Formerly: ENEE759K.

ENEE657 Computer Security (3 Credits)
An introduction to the principles of building secure systems. Topics include operating system (OS) security, secure network communications, software security, real-world attacks, applied cryptography, and hardware security. Within these topics, the course emphasizes the cross-cutting concerns of attacks, defenses and measurement.
Prerequisite: ENEE457 or CMSC414; or students who have taken courses with comparable content may contact the department.

ENEE660 System Theory (3 Credits)
General systems models. State variables and state space. Linearity and its implications. Controllability and observability. State space structure and representation. Realization theory and algorithmic solutions. Parameterizations of linear systems; canonical forms. Basic results from stability theory. Stabilizability. Fine structure of linear multivariable systems; minimal indices and polynomial matrices. Interplay between frequency domain and state space.
Prerequisite: ENEE460 and MATH463; or students who have taken courses with comparable content may contact the department.

ENEE661 Nonlinear Control Systems (3 Credits)
State space methods of stability analysis including second order systems and the phase plane, linearization and stability in the small, stability in the large and Lyapunov's second method. Frequency domain methods including the describing function. Popov's method and functional analytic methods. Introduction to Volterra series representations of nonlinear systems. Applications to conrol system design.
Prerequisite: ENEE660; and (MATH410 or MATH411; or students who have taken courses with comparable content may contact the department). Or permission of instructor.

ENEE662 Convex Optimization (3 Credits)
Focuses on recognizing, solving, and analyzing convex optimization problems. Convex sets, convex functions, convex and quasi-convex optimization problems. Duality theory and optimality conditions. Specific classes of problems including linear optimization (LP), semi-definite optimization (SDP), geometric programming. Algorithms for unconstrained and constrained optimization; interior-point methods. Applications in controls, communications, signal processing, statistics, and other areas.
Recommended: MATH410.
Credit Only Granted for: ENEE759F or ENEE662.

ENEE664 Optimal Control (3 Credits)
General optimization and control problems. Conditions of optimality for unconstrained and constrained optimization problems; sensitivity; duality. Introduction to linear and nonlinear programming methods. Dynamic optimization. Discrete time maximum principle and applications. Pontryagin maximum principle in continuous time. Dynamic programming. Feedback realization of optimal control.
Prerequisite: ENEE660 and MATH410; or students who have taken courses with comparable content may contact the department; or permission of instructor.
Corequisite: MATH411; or permission of instructor.

ENEE680 Fundamentals of Electromagnetics (3 Credits)
Theoretical analysis and engineering applications of Maxwell's equations: boundary value problems of electrostatics and magnetostatics, dielectric and magnetic properties of matter, energy and momentum content of fields, introduction to EM wave propagation.
Prerequisite: ENEE381; or students who have taken courses with comparable content may contact the department.

ENEE681 Electromagnetic Waves and Applications (3 Credits)
Review of Maxwell's equations: potentials, EM energy and momentum, EM plane waves. Properties of waves: dispersion, group velocity, diffraction, the ray optic limit. Waves in media: left-handed media, anisotropic media, wave guides, fibers, cavities. Radiation: antennas, Cherenkov radiation, radiation by accelerated charges, scattering. Additional topics: Wave chaos, Special Relativity.
Prerequisite: ENEE381; or students who have taken courses with comparable content may contact the department.

ENEE686 Charged Particle Dynamics, Electron and Ion Beams (3 Credits)
General principles of single-particle dynamics; mapping of the electric and magnetic fields; equation of motion and methods of solution; production and control of charge particle beams; electron optics; Liouville's theorem; space charge effects in high current beams; design principles of special electron and ion beam devices.

ENEE690 Introduction to Quantum Mechanics (3 Credits)
Introduction to the Schroedinger equation, matrix formulations of quantum mechanics, identical particles, entanglement, approximation methods, symmetries. Applications to solid-state, atomic, and quantum information science.
Prerequisite: ENEE381; or students who have taken courses with comparable content may contact the department.

ENEE691 Optical Communication Systems (3 Credits)
Optical components and systems. Measures of performance of optical communication systems. Topics include: single and multi-mode optical fibers, DFB and DBR lasers, transmitters and receivers, pin and APD detectors, noise analysis, receiver sensitivity modulation formats, system performance, bit-error-rate, power budget, TDM and WDM systems, network architecture.

ENEE692 Introduction to Photonics (3 Credits)
Introduction to photonic concepts and applications. In particular, high quality factor optical resonators, photonic crystals, microresonators, statistical and photon optics, spontaneous and stimulated emission, semiconductor lasers and detectors, modulators and optical switches are discussed. Finally, the concept of photons and the quantum states of light are presented.
Prerequisite: ENEE380 and ENEE381; or students who have taken courses with comparable content may contact the department.

ENEE698 Graduate Seminar (1-3 Credits)
Every semester regular seminars are held in electrical science and in the six areas of specialization offered by the electrical engineering department. They may be taken, by arrangement with the student's advisor, for repeated credit.
Restriction: Permission of instructor.

ENEE699 Independent Studies in Electrical Engineering (1-3 Credits)
Supervised individual study or project, or supervised group study or project, at an advanced level, in electrical engineering.
Repeatable to: 99 credits if content differs.
Formerly: ENEE609.

ENEE704 Physics and Simulation of Semiconductor Devices (3 Credits)
The physics of electron transport in semiconductor devices will be covered. Numerical methods for attaining solutions to transport equations will be explored. Students will also learn how to use CAD tools fro semiconductor device design. Nano-electronic devices will be introduced.
Recommended: ENEE601 and ENEE600; and exposure to quantum mechanics.
Credit Only Granted for: ENEE694 and ENEE704.
Formerly: ENEE694.

ENEE719 Advanced Topics in Microelectronics (3 Credits)
Repeatable to: 99 credits if content differs.
Formerly: ENEE718.

ENEE729 Advanced Topics in Communication (3 Credits)
Repeatable to: 99 credits if content differs.
Formerly: ENEE728.

ENEE731 Image Understanding (3 Credits)
An advanced graduate level course on image understanding. Mathematical and statistical approaches to solving image understanding problems will be discussed. Topics to be covered include: optimal edge and shape detection; image understanding using Markov random field models; Monte Carlo Markov Chain techniques for image understanding; shape from shading, stereo, texture and contour; structure from motion and object recognition. Existence, uniqueness and convergence issues for many of these problems will be discussed.
Prerequisite: ENEE631 and ENEE633.
Credit Only Granted for: ENEE739J or ENEE731.
Formerly: ENEE739J.

ENEE739 Advanced Topics in Signal Processing (3 Credits)
Repeatable to: 99 credits if content differs.
Formerly: ENEE738.

ENEE749 Advanced Digital Systems Design (3 Credits)
VLSI architecture and algorithms; design strategies; design methodologies; system-level design; area/delay/power trade-offs; high performance systems; multi-chip modules; low-power design; hardware/software co-design; design for testability, design for manufacturability; algorithm, architecture, and component design for adaptive computing systems; prototype system development and test, possible chip fabrication by MOSIS and subsequent chip testing.
Prerequisite: ENEE640 or ENEE644.
Restriction: Permission of instructor.
Repeatable to: 6 credits if content differs.

ENEE757 Security in Distributed Systems and Networks (3 Credits)
Threats and countermeasures in centralized and distributed systems; communication security techniques based on encryption; symmetric and asymmetric encryption; encryption modes, including stream and block encryption, and cipher block chaining; message origin and mutual authentication; third-party and inter-realm authentication, authentication of mobile users; data confidentiality and integrity protocols; formal analysis of authentication protocols and message integrity; access control in distributed systems and networks; firewall design; case studies of security mechanisms and policies.
Prerequisite: ENEE647; or permission of instructor.

ENEE759 Advanced Topics in Computer Engineering (3 Credits)
Topics, as announced every semester, from the field of computer engineering and its applications.
Repeatable to: 99 credits if content differs.

ENEE762 Stochastic Control (3 Credits)
Stochastic control systems, numerical methods for the Ricatti equation, the separation principle, control of linear systems with Gaussian signals and quadratic cost, non-linear stochastic control, stochastic stability, introduction to stochastic games.
Prerequisite: ENEE620 and ENEE660; or students who have taken courses with comparable content may contact the department.

ENEE763 Advanced Nonlinear Control Systems (3 Credits)
General introduction to the geometric theory of nonlinear control systems. Theory of decoupling, disturbance rejection, feedback linearization, stability, stabilization, etc.
Prerequisite: ENEE661; or permission of instructor.

ENEE765 Adaptive Control (3 Credits)
General principles of adaptive control. Self-tuning regulators and model reference adaptive systems. Theoretical issues: stability, convergence, and robustness. Practical issues: implementation, computation, auto-tuning, and other successful application. Alternatives to adaptive control.
Prerequisite: ENEE660 and ENEE664; or students who have taken courses with comparable content may contact the department.

ENEE769 Advanced Topics in Controls (3 Credits)
Topics selected, as announced every semester, from the field of controls and its applications.
Repeatable to: 99 credits if content differs.

ENEE789 Advanced Topics in Electrophysics (3 Credits)
Topics selected, as announced every semester, from the field of electrophysics and its applications.
Repeatable to: 99 credits if content differs.
Formerly: ENEE788.

ENEE790 Quantum Electronics I (3 Credits)
Spontaneous emission, interaction of radiation and matter, masers, optical resonators, the gas, solid and semi-conductor lasers, electro-optical effect, propagation in anisotropic media and light modulation.
Prerequisite: Must have knowledge of quantum mechanics; or permission of instructor.

ENEE791 Quantum Electronics II (3 Credits)
Nonlinear optical effects and devices, tunable coherent light sources: optical parametric oscillator; frequency conversion and dye laser. Ultrashort pulse generation and measurement, stimulated raman effect, and applications. Interaction of acoustic and optical waves, and holography.

ENEE798 Advanced Topics in Electrical Engineering (3 Credits)
Topics selected, as announced every semester.
Formerly: ENEE648.

ENEE799 Master's Thesis Research (1-6 Credits)

ENEE889 Teaching Workshop (1 Credit)
Provide training in education for senior PhD students who contemplate an academic career, and give them the opportunity to gain some teaching experience. Emphasis is on issues that are of special importance in electrical and computer engineering education.
Restriction: Must be in ENGR: MS/PhD-Electrical Engineering (Doctoral) program; and permission of ENGR-Electrical & Computer Engineering department.
Repeatable to: 4 credits if content differs.

ENEE898 Pre-Candidacy Research (1-8 Credits)
Provide training in education for senior PhD students who contemplate an academic career, and give them the opportunity to gain some teaching experience. Emphasis is on issues that are of special importance in electrical and computer engineering education.
Restriction: Must be in ENGR: MS/PhD-Electrical Engineering (Doctoral) program; and permission of ENGR-Electrical & Computer Engineering department.
Repeatable to: 4 credits if content differs.

ENEE899 Doctoral Dissertation Research (1-8 Credits)

ENES - Engineering Science

ENES401 Entrepreneurial Design Realization (3 Credits)
The vision for this course, and an aspect that makes it unique, is to expose students to the opportunities and challenges of bringing a product design to reality (entrepreneurship). The emphasis is on environmentally and socially sustainable projects. The end-product of this course will be full-scale implementations or complete design "packages" that can be taken to potential stakeholders.
Cross-listed with: ENME401.
Restriction: Must have senior standing and permission of instructor.
Credit Only Granted for: ENME401, ENME489B or ENES401.
Formerly: ENME489B.

ENES424 Engineering Leadership Capstone: Inclusive Leadership in Addressing Organizational & Societal Challenges (3 Credits)
The Minor in Global Engineering Leadership is designed to bring together one's understanding of leadership, organizations, culture, and global studies and apply this synthesized learning to a capstone project. The project will provide real-world application of global leadership principles to address an organizational or societal need. Students will utilize an inclusive leadership and global mindset to propose a big idea which brings about a positive organizational or societal change.
Prerequisite: ENES472 and ENES317.
Restriction: Must be in the Global Engineering Leadership minor (#EN09).

ENES428 Engineering Research for Exchange Students (3-12 Credits)
Directed research within the Clark School of Engineering for international exchange students.
Restriction: Available only to visiting exchange students taking part in an Engineering exchange program.
Repeatable to: 24 credits.

ENES434 Creating Historic Woodwinds (3 Credits)
Students will learn the art of woodworking and blend techniques of modern and historic instrument-making methods. Using wood lathes, metalworking tools, 3d scanners and selective laser sintering 3d printers. Student teams will first train to acquire the skills needed to use fabrication equipment. Each mixed team will then share their individual discipline's skills to help contribute to the creation of a completed musical instrument. Along the way, we'll explore the historical and cultural context of instrument making and the musical period.
Cross-listed with: MUSC434.
Restriction: Permission of the School of Music.
Credit Only Granted for: ENES434 or MUSC434.

ENES440 Science, Technology, Ethics, and Policy: Minor Program Capstone (3 Credits)
Capstone research seminar for students in the Science, Technology, Ethics, and Policy Minor program.
Prerequisite: Students must receive a B- or better in ENES240 and take 2 courses from the STEP minor elective list.
Restriction: Must be in the Science, Technology, Ethics, and Policy minor.
Additional Information: This is the culminating course the STEP minor program.

ENES442 Creating Historic Woodwinds (3 Credits)
In this class, students will learn the art of woodworking and blend techniques of modern and historic instrument-making methods. Using wood lathes, metalworking tools, 3d scanners and selective laser sintering 3d printers. Student teams will first train to acquire the skills needed to use fabrication equipment. Each mixed team will then share their individual discipline's skills to help contribute to the creation of a completed musical instrument. Along the way, we'll explore the historical and cultural context of instrument making and the musical period.
Cross-listed with: MUSC442.
Credit Only Granted for: MUSC442 or ENES442.

ENES458 Topics in International Engineering (1-4 Credits)
A variety of topics related to engineering in a global context are discussed including cultural aspects, cross-cultural communication, international standards and law, and engineering and technology issues, business behavior, attitudes and values of selected countries and regions.
Prerequisite: ENES100.
Repeatable to: 12 credits if content differs.

ENES459 Study Abroad Special Topics in Engineering IV (1-6 Credits)
Special topics course in engineering science taken as part of an approved study abroad program.
Repeatable to: 15 credits if content differs.

ENES460 Fundamentals of Technology Start-Up Ventures (3 Credits)
Fundamental aspects of creating, organizing, funding, managing, and growing a technology startup venture. This multidisciplinary course will draw on management, business, legal, financial, as well as technical, concepts. Students form teams and develop a business plan for a technology company, based on each team's own business idea and then present the plan to a panel of outside experts.
Restriction: Permission of ENGR-Maryland Technology Enterprise Institute.
Credit Only Granted for: ENES460, BMGT461, SMLP470 or HLMN470.
Additional Information: Course may not be used to fulfill any BMGT major or minor program requirement.

ENES461 Advanced Entrepreneurial Opportunity Analysis in Technology Ventures (3 Credits)
Explores the factors that influence entrepreneurial opportunity analysis in technology-based ventures. Uses a cognitive theoretical framework to examine the integration of motivation, emotions and information processing modes to make complex entrepreneurial decisions in technology venture environments.
Credit Only Granted for: ENES210 or ENES461.

ENES462 Marketing High-Technology Products and Innovations (3 Credits)
Examines the opportunities and challenges of marketing high-technology products in turbulent environments requiring rapid decision making with incomplete information. Explores how innovations are introduced at frequent intervals, research-and-development spending is vital, and there are high mortality rates for both products and businesses.
Restriction: Permission of ENGR-Maryland Technology Enterprise Institute.
Additional Information: Course may not be used to fulfill any BMGT major or minor program requirement.

ENES463 Strategies for Managing Innovation (3 Credits)
Emphasizes how the technology entrepreneur can use strategic management of innovation and technology to enhance firm performance. Examines the process of technological change, the ways that firms come up with innovations, the strategies that firms use to benefit from innovation, and the process of formulating technology strategy. Provides frameworks for analyzing key aspects of these industries and teaches students how to apply these frameworks.
Restriction: Permission of ENGR-Maryland Technology Enterprise Institute.
Credit Only Granted for: ENES463, BMGT467, SMLP473 or HLMN472.
Additional Information: Course may not be used to fulfill any BMGT major or minor program requirement.

ENES464 International Entrepreneurship and Innovation (3 Credits)
Focuses on the need for every entrepreneur and innovator to understand the global market in today's hypercompetitive world, and to appreciate how to compete effectively in domestic markets by managing international competitors, suppliers, and influences. Explore how the distinction between foreign and domestic markets is becoming less pronounced. Develop skills to identify and manage opportunities on a global basis.
Restriction: Permission of ENGR-Maryland Technology Enterprise Institute.
Additional Information: Course may not be used to fulfill any BMGT major or minor program requirement.

ENES466 Leading and Financing the Technology Venture (3 Credits)
Focuses on the challenges of leading and financing new technology ventures. Leadership topics include team selection and formation, aligning rewards with relative contributions of team members, and how early decisions can enable or prevent founders from achieving results that align with their individual motivations for becoming an entrepreneur. Essential tools and methods for building a strong financial foundation for a new technology venture are examined. Includes important accounting principles as well as methods for keeping financial control of the technology venture. Insights are shared on navigating the multitude of financial barriers that may block your entrepreneurial success, as well as how to grow the technology venture from concept through launch.
Restriction: Permission of ENGR-Maryland Technology Enterprise Institute.
Credit Only Granted for: ENES466, BMGT365, SMLP471 or HLMN471.
Additional Information: Course may not be used to fulfill any BMGT major or minor program requirement.

ENES467 Engineering for Social Change (3 Credits)
Critical analysis of issues at the intersection of engineering, philanthropy and social change. How engineering design, products and processes have created social change in the past and will do so in the future through both intended and unintended consequences. Topics covered include energy, sustainability and climate change, autonomy, the digital future, low cost engineering, manufacturing, philanthropy, ethics and the impact of electronics on society, among others. Faculty and external experts will engage with students on these topics. Students will broadly engage with organizations involved in using technology for positive social impact.
Cross-listed with: ENME467.
Restriction: Junior standing or higher.
Credit Only Granted for: ENES467 or ENME467.
Additional Information: Students in the Mechanical Engineering (ENME) major should register for ENME467, all other majors should register under ENES467.

ENES471 Legal Aspects of Entrepreneurship (3 Credits)
Explores critical legal and business issues entrepreneurs face as they build and launch a new venture. Examines real world scenarios, and addresses the legal issues at all of the important junctures along the path to success. Significant attention placed on new venture formation, intellectual property management, and financing arrangements.
Restriction: Must be in the Minor in Technology Entrepreneurship & Corporate Innovation (#EN06).
Additional Information: Course may not be used to fulfill any BMGT major or minor program requirement.

ENES472 Leading Global Teams and Engaging Across Cultures in Business, Engineering, and Technology (3 Credits)
Develop global leadership capacities and an understanding of the cultural aspects pertaining to industry and international business. In a globalized world, the ability to work, lead and communicate in culturally diverse settings has become a core component to leadership. Through real-world examples, research, and simulations, students will increase their self-awareness and understanding of culture and how culture influences attitudes, behaviors, and practices at the individual, organizational, or societal levels. Students will develop the skills necessary to navigate, negotiate, and lead cross-cultural engagements and teams. The course content is relevant and applicable to anyone interested in developing cross-cultural leadership competencies and cultivating a global mindset.
Restriction: Sophomore standing or higher; must be a minor in Global Engineering Leadership (#EN09), Global Poverty (#AG06), Global Terrorism Studies (#BS07), or International Development and Conflict Management (#BS02).
Credit Only Granted for: ENES472, SLLC471, or SLLC473.
Additional Information: Students not meeting restriction requirements should add themselves to the course holdfile. Restrictions DO NOT apply to winter and summer terms.

ENES474 Global Perspectives of Engineering (3 Credits)
Faculty supervised research on aspects of engineering in a foreign country including leading fields of research, key world markets, and the culture of the engineering workplace. Students will produce a comprehensive report exhibiting their expertise in their chosen country and the field of engineering within.
Prerequisite: ENES100; or permission of ENGR-A. James Clark School of Engineering.
Restriction: Must be in the International Engineering Minor.
Credit Only Granted for: ENES458M or ENES474.
Formerly: ENES458M.

ENES475 Leadership in Times of Crisis: Pandemics, Disasters, and Humanitarian Crises (3 Credits)
Students are provided with immersive opportunities to learn from industry professionals about crisis prevention and response by examining leadership throughout the crisis cycle: from identification, prevention, and preparation, to response, recovery, and rebuilding. The course brings together the study and practice of leadership with promising practices in disaster preparedness and data informed decision-making. This course will examine how leadership has been enacted to help local, national, and global communities navigate through pandemics, disasters, and other humanitarian crises. Students will develop capacities for informed leadership in times of crisis and develop an understanding for applying these skills in a variety of settings.
Restriction: Must have earned a minimum of 60 credits.
Credit Only Granted for: ENES275 or ENES475.

ENES478 Topics in Engineering Education (1 Credit)
Topics related to teaching engineering courses, particularly project-based courses. Topics can include learning styles, student development theory, multicultural issues in teaching, facilitating team experiences, assessment, and academic integrity.
Restriction: Must be in the Engineering Teaching Fellow program.
Repeatable to: 3 credits if content differs.

ENES480 Engineering Honors Seminar I (1 Credit)
Introduction to engineering leadership, professionalism, and ethics. Discussions of leadership style, elements of success, professional communication, codes of ethics, handling of ethical dilemmas, and the characteristics of a professional.
Restriction: Must be in College of Engineering Honors; and junior standing or higher.

ENES481 Engineering Honors Seminar II (1 Credit)
Introduction to engineering creativity and innovation in engineering. Application of methods of creativity to topics in communication, conducting research, and leadership.
Restriction: Must be in College of Engineering Honors; and junior standing or higher.

ENES489 Special Topics in Engineering (3-6 Credits)
Special topics in engineering.
Prerequisite: Permission of ENGR-A. James Clark School of Engineering.
Repeatable to: 6 credits if content differs.

ENES498 Special Topics in Entrepreneurship (3 Credits)
This entrepreneurship seminar and case study-based course will explore technology entrepreneurship with a focus on leadership, marketing, team-building, and management of new technology ventures and assumes baseline knowledge of entrepreneurship. Students will learn skills needed to succeed as a technology entrepreneur and how to apply best practices for planning, launching, and growing new companies. This course is a requirement of the Hinman CEOs program.
Restriction: Must be in Hinman CEOs Program.
Repeatable to: 12 credits if content differs.

ENES499 Senior Projects in Engineering (3 Credits)
Students will work in large teams to solve a multidisciplinary research/design problem. The course will begin with students identifying opportunities, brainstorming project concepts to address these opportunities, applying lean startup and design thinking strategies, and then selecting/proposing a project for the semester. Acceptable projects will require the multidisciplinary design, construction and testing of a project within limited budget and time constraints.
Prerequisite: Permission of ENGR-A. James Clark School of Engineering; and completion of all 1XX and 2xx level (lower-division) technical courses in engineering major with a C- or better.
Restriction: Must be in a major in ENGR-A. James Clark School of Engineering.
Repeatable to: 6 credits if content differs.

ENES601 Future Faculty Program Seminar I (1 Credit)
Introduction to and development of skills necessary to obtain and succeed in a university faculty position. Emphasis on technical writing and effective presentations. Discussion of research diversification, networking, ethics and professionalism.
Restriction: Must be in the Clark School Future Faculty Program.

ENES602 Future Faculty Program Seminar II (1 Credit)
Effective teaching techniques. Basic principles of education and learning. Developing a course; promoting active learning, problem solving and critical thinking; designing exam and assignments; and communicating effectively with students.
Restriction: Must be in the Clark School Future Faculty Program.

ENES603 Future Faculty Program Seminar III (1 Credit)
Developing a successful faculty research program. Establishing and maintaining a research group. Finding funding opportunities and writing grant proposals. Mentoring graduate students. Faculty position application process. Preparing research and teaching statements.
Restriction: Must be in the Clark School Future Faculty Program.

ENES604 Future Faculty Program Teaching Practicum (1 Credit)
Graduate students will co-teach a course under supervision of a faculty mentor. Graudate students will be involved in all aspects of the course including development of syllabus, presenting lectures, writing and grading examiniations, and evaluating the students in the course.
Prerequisite: ENES602.
Restriction: Must be a graduate student in the Clark School Future Faculty Program; and students for whom English is not the native language must pass the Maryland English Institute ITA Evaluation prior to enrolling in this course.

ENES658 Special Topics in Engineering in a Global Context (1-3 Credits)
Advanced topics in engineering in a global context.
Restriction: Graduate standing or permission of instructor.
Repeatable to: 12 credits if content differs.

ENES660 Fundamentals of Product Management (3 Credits)
Provides a comprehensive survey of product management and its growing role in producing technology-driven products that customers love. Guides students through the product lifecycle and market lifecycle, diving into the competencies needed at each stage. Topics include startup and corporate strategy, product strategy, vision setting and evangelism, development lifecycle approaches based on customer involvement and product stage, the various types of innovation at each stage of the lifecycle, and how the product manager leads the team through it all. Learn the basics of customer discovery, product discovery, product delivery, and the core-context model for managing products through maturity.
Restriction: Must be in the Product Management Master of Professional Studies program; or permission of Maryland Technology Enterprise Institute.

ENES662 Innovative Ideas and Concept Development (3 Credits)
Enables aspiring entrepreneurs to understand the content, methods, and models for new venture opportunity assessment and analysis. Focuses on how to identify and analyze entrepreneurial opportunities for technology-based ventures by first understanding the personal self and decision-making factors. Explores how to evaluate new venture opportunities and challenges within industries and markets.
Restriction: Must be in the Technology Entrepreneurship and Corporate Innovation Master of Professional Studies program; or permission of Maryland Technology Enterprise Institute.

ENES663 Strategies for Managing Innovation (3 Credits)
Emphasizes how innovative leaders can use strategic management of innovation and technology to enhance firm performance. It helps students to understand the process of technological change; the ways that firms come up with innovations; the strategies that firms use to benefit from innovation; and the process of formulating technology strategy. It provides frameworks for analyzing key aspects of these industries and teaches students how to apply these frameworks.
Restriction: Must be in the Product Management or the Technology Entrepreneurship and Corporate Innovation Master of Professional Studies programs; or permission of Maryland Technology Enterprise Institute.

ENES664 Business Modeling and Customer Validation (3 Credits)
Focuses on how to create and deliver value for customers and extract value for the new venture. Develop business models that encompass the product or service, customers, and the economic engine to meet the venture's financial and growth objectives. Introduces a structured way to think about, analyze, and develop a sound business model that is customer validated.
Restriction: Must be in the Product Management or the Technology Entrepreneurship and Corporate Innovation Master of Professional Studies programs; or permission of Maryland Technology Enterprise Institute.

ENES665 Innovative Thinking (3 Credits)
Introduces students to new and powerful tools to boost their creative problem solving skills. Participants re-discover their communication and teaming skills. Students unlock their creativity potential, and explore win-win approaches to define and solve problems of different kinds. Students are also introduced to topics related to intellectual property.
Restriction: Must be in the Product Management or the Technology Entrepreneurship and Corporate Innovation Master of Professional Studies programs; or permission of Maryland Technology Enterprise Institute.

ENES666 Creative Design, Prototyping, and Testing (3 Credits)
Transition from creative, innovative, design thinking methods to prototyping and concept testing of products and services. Learn how to translate ideas into marketable offerings to create real value for customers and the new venture. Emphasis is placed on an integrated and interdisciplinary approach to engineering design, concurrent engineering, design for manufacturing, industrial design, and the business of new product development. Topics include design methods, modeling and simulation, material and manufacturing process selection, platform and modular design, mass customization, planning and scheduling, and business issues, teamwork, group dynamics, creativity, and innovation.
Restriction: Must be in the Technology Entrepreneurship and Corporate Innovation Master of Professional Studies program; or permission of Maryland Technology Enterprise Institute.

ENES667 Market Development and Commercialization (3 Credits)
Provides an orientation to key marketing concepts critical to marketing technology-based products and services. Learn to identify market opportunities, understand customer preferences, evaluate market acceptance, and devise the appropriate going to market strategies for the new venture.
Restriction: Must be in the Product Management or the Technology Entrepreneurship and Corporate Innovation Master of Professional Studies programs; or permission of Maryland Technology Enterprise Institute.

ENES668 Corporate Technology Entrepreneurship (3 Credits)
Focuses on the role of entrepreneurial individuals inside of existing technology organizations. Explores developing and leading innovation inside the firm. Discusses stages of innovation in the corporate entrepreneurship process and dynamics of organizational structure, politics, decisions, financing, and personal styles.
Credit Only Granted for: ENPM 808N or ENES 668.
Formerly: ENPM 808N.

ENES670 Financial Management and New Venture Financing (3 Credits)
Provides the essential tools and skills to build a strong financial foundation for a new technology venture. Examines accounting principles as well as methods for keeping firm financial control of the venture. Discusses navigating the multitude of financial barriers that may block entrepreneurial success, as well as how to raise the right amount of capital at the right time from the right source.
Restriction: Must be in the Technology Entrepreneurship and Corporate Innovation Master of Professional Studies program; or permission of Maryland Technology Enterprise Institute.

ENES671 Legal Aspects of Entrepreneurship (3 Credits)
Explores critical legal and business issues entrepreneurs face as they build and launch a new venture. Examines real world scenarios, and addresses the legal issues at all of the important junctures along the path to success. Significant attention placed on new venture formation, intellectual property management, and financing arrangements.
Restriction: Must be in the Technology Entrepreneurship and Corporate Innovation Master of Professional Studies program; or permission of Maryland Technology Enterprise Institute.

ENES672 Launching Technology Startup Ventures (6 Credits)
Explores the processes and skills needed to launch and manage technology startup ventures. Learn how to apply best practices for planning, launching, and leading new companies. Discusses a wide range of issues of importance and concern to entrepreneurs, to include how to navigate uncertainty.
Restriction: Must be in the Technology Entrepreneurship and Corporate Innovation Master of Professional Studies program; or permission of Maryland Technology Enterprise Institute.

ENES673 Financing the Product Life Cycle (3 Credits)
Provides the essential tools and skills to build a strong financial foundation for designing, developing, and managing new products within established companies and organizations. Examines accounting principles as well as methods for managing the financials of the product. Discusses navigating the multitude of financial barriers that may block success, as well as how to raise the right amount of capital at the right time from the right source, with an emphasis on internal company financing.
Restriction: Must be in the Product Management Master of Professional Studies program; or permission of Maryland Technology Enterprise Institute.

ENES674 Managing Product Development and Operations (3 Credits)
Explores the evolution of modern management methods for operations and product development. Evaluates production and operation methods from inception to factory-based models of productivity, through the quality and lean movements, to the explosion of productivity with modern approaches. Focuses on how to effectively run large-scale agile teams with agile engineering at its core.
Restriction: Must be in the Product Management Master of Professional Studies program; or permission of Maryland Technology Enterprise Institute.

ENES676 Negotiation and Problem-Solving (3 Credits)
Explores key negotiation techniques, how to apply these techniques, and their application to real-world scenarios. Establishes an understanding of deal-making, and creates a foundation for exploring the concepts of agreements, contracts, conflicts, and how the resulting transactions formed the foundation for modern scaled economies. Examines reputation effects, customer lifetime value, the basics of civil and criminal law, and how these have formed to constrain our interactions in modern society.
Restriction: Must be in the Product Management Master of Professional Studies program; or permission of Maryland Technology Enterprise Institute.

ENES677 Data Analysis and Decision Making (3 Credits)
Provides a comprehensive understanding of making decisions under uncertainty for products, portfolios, and programs across various industries and environments. Focuses on the use of Bayesian methods for informing decisions on products and programs when directing experiments. Examines the testing of product ideas throughout the lifecycle, from customer discover, to product discovery, to product design and optimization, to channel testing and marketing for growth.
Restriction: Must be in the Product Management Master of Professional Studies program; or permission of Maryland Technology Enterprise Institute.

ENES680 Building and Leading Innovative Organizations (3 Credits)
Focuses on building a product enterprise through lean product portfolio management. Defines the conceptual groundwork that enables achieving the vision of a customer-centric value creation business model centered around lean principles. Explains the details of building a scaled product enterprise and explores alignment of organizational support functions with a product framework that lays the pathway for a sustainable value maximizing enterprise at scale.
Restriction: Must be in the Product Management Master of Professional Studies program; or permission of Maryland Technology Enterprise Institute.

ENFP - Engineering, Fire Protection

ENFP405 Structural Fire Protection (3 Credits)
Effects of elevated temperature on structural materials; steel, concrete, wood, gypsum, glass and reinforced plastics. Experimental evaluation of fire resistance of building assemblies. Analytical methods to evaluate fire resistance of structural members.
Prerequisite: ENES220.
Jointly offered with: ENFP621.
Restriction: Must be in Engineering: Fire Protection program; and permission of ENGR-Fire Protection Engineering department.
Credit Only Granted for: ENFP405 or ENFP621.

ENFP410 Special Hazard Suppression Systems (3 Credits)
Analysis of application and theory of fire suppression systems. The key elements of fire suppression systems will be discussed along with how they interact for effective fire suppression design. Physical mechanisms for a variety of fire suppression approaches will be discussed including hose streams, sprinklers, water mist, foam, clean agents, and chemical agents.
Prerequisite: ENFP310 and ENFP312.
Jointly offered with: ENFP610.
Restriction: Permission of ENGR-Fire Protection Engineering department.
Credit Only Granted for: ENFP410, ENFP610 or ENFP653.

ENFP411 Risk-Informed Performance Based Design (3 Credits)
Appraisal and measurement of fire safety. Application of systems analysis, probability theory, engineering economy and risk management in the identification and synthesis of components of fire protection engineering. Methods for the development of criteria for the design, evaluation and assessment of fire safety or component hazards.
Restriction: Senior standing; or permission of ENGR-Fire Protection Engineering department.

ENFP413 Human Response to Fire (3 Credits)
Fractional effective dose (FED) methods for predicting time to incapacitation and death of fires for use in fire safety calculations. Physiology and toxicology of the fire effluent components, decomposition chemistry of common materials, standard experimental approaches. Predictive models of material production rates. People movement characteristics related to building evacuation. Formulation and application of evacuation models. Human behavior factors affecting response of people to fire situations.
Prerequisite: ENFP250.
Restriction: Permission of ENGR-Fire Protection Engineering department. Jointly offered with ENFP613.
Credit Only Granted for: ENFP413 or ENFP613.

ENFP415 Fire Dynamics (3 Credits)
Designed to give students a quantitative understanding of fire behavior. The fundamentals of physics and chemistry of combustion are presented and used to derive key analytical relationships that describe fire growth. Application of these relationships to the analysis of common fire scenarios is emphasized.
Prerequisite: ENFP312.
Restriction: Permission of ENGR-Fire Protection Engineering department. Jointly offered with ENFP651.
Credit Only Granted for: ENFP415 or ENFP651.

ENFP420 Fire Assessment Methods and Laboratory (4 Credits)
Experimental evaluation of ignition, flame spread, rate of heat release and smoke production of flammable gases, liquids, solids, and interior finish materials. Analytical and computer methods for the design, performance, and analysis of fire experiments. Preparation of laboratory reports.
Prerequisite: Student must have senior standing; and minimum grade of C- in ENFP312.
Restriction: Must be in Engineering: Fire Protection program.
Credit Only Granted for: ENFP320 or ENFP420.
Formerly: ENFP320.

ENFP425 Enclosure Fire Modeling (3 Credits)
An introduction to enclosure fire dynamics through the development of fire modeling algorithms and the application of computer-based fire modeling techniques. The objectives of the course are: to provide a basic understanding of enclosure fire dynamics with an emphasis on a system-level viewpoint (i.e., a global description of the coupling between combustion dynamics, smoke filling, vent flows and heat transfer); and to provide an introduction to the zone modeling approach. Topics covered include a review of the mathematical formulation of zone models, a discussion of numerical integration of the zone modeling equations (using MATLAB), and an introduction to zone modeling software used by professional engineers (e.g., CFAST).
Prerequisite: ENES232, ENFP300, and ENFP312.
Restriction: Must be in Engineering: Fire Protection program; and senior standing; and permission of ENGR-Fire Protection Engineering department.

ENFP426 Computational Methods in Fire Protection (3 Credits)
Introduction to computer-based fire modeling: zone modeling and Computational Fluid Dynamics (CFD); documentation of input data, validation and verification tests.
Recommended: ENFP425.
Restriction: Permission of ENGR-Fire Protection Engineering department.

ENFP429 Independent Studies (1-3 Credits)
For students who have definite plans for individual study of approved problems, or study of an advanced topic selected in conjunction with the faculty.
Prerequisite: Permission of ENGR-Fire Protection Engineering department.
Restriction: Must be in Engineering: Fire Protection program.
Repeatable to: 6 credits if content differs.

ENFP440 Smoke Management and Fire Alarm Systems (3 Credits)
Analysis of hazard posed by smoke in buildings. Performance characteristics of smoke management systems. Review of analytical design aids. Functional analysis and design of fire detection and alerting systems. Examination and evaluation of code criteria, performance specifications and research.
Prerequisite: Must have completed with a C- or better or concurrently be enrolled in ENFP300.
Jointly offered with: ENFP627.
Restriction: Permission of ENGR-Fire Protection Engineering department.
Credit Only Granted for: ENFP440 or ENFP627.

ENFP461 Think Tank (3 Credits)
Designed to have the student apply critical thinking in both engineering and business terms through a unique combination of student-driven, competition-based, long-term, targeted learning.
Recommended: Junior standing in fire protection engineering.
Restriction: Permission of ENGR-Fire Protection Engineering department.

ENFP464 Industrial Fire Safety (3 Credits)
Designed to introduce students to the basics of process safety with a focus on the methods and techniques that may be utilized when evaluating the existing or proposed safety protection solutions in industrial facilities. An emphasis is placed on properly identifying the hazards that are present, the risk exposure, and how best to address the risk. The foundation is laid by presenting the necessary background information on industrial processes and integrating this information with applicable fire/explosion safety science.
Prerequisite: Students must be of senior standing.
Restriction: Permission of ENGR-Fire Protection Engineering department.
Also offered as: ENFP664.
Credit Only Granted for: ENFP464, ENFP489I, ENFP629I OR ENFP664.
Formerly: ENFP489I.
Additional Information: The course will be taught as a dual senior-level undergraduate course and graduate course.

ENFP465 Fire and Explosion Investigations (3 Credits)
This course covers many aspects of fire and explosion investigation and reconstruction. Information on field techniques, applicable standards, and best practices are presented with an emphasis on how fire science and fire dynamics can be applied to forensic analysis. Experiments are performed and analyzed to demonstrate the concepts.
Prerequisite: Student should have senior standing.
Jointly offered with: ENFP665.
Restriction: Permission of ENGR-Fire Protection Engineering department.
Credit Only Granted for: ENFP489N, ENFP629N, ENFP465 OR ENFP665.
Formerly: ENFP489N.

ENFP467 Wildland Fires: Science and Applications (3 Credits)
Introduction to the global problem of wildland fires with an overview of the social, political and environmental issues posed as well as detailed coverage of the science, technology and applications used to predict, prevent and suppress wildland fires.
Prerequisite: ENFP312.
Restriction: Must be in Engineering: Fire Protection program; and permission of ENGR-Fire Protection Engineering department.
Credit Only Granted for: ENFP489W, ENFP629W, or ENFP667.
Formerly: ENFP489W.

ENFP489 Special Topics (3 Credits)
Selected topics of current importance to fire protection.
Prerequisite: Permission of ENGR-Fire Protection Engineering department.
Repeatable to: 6 credits.

ENFP601 Introduction to Fire Protection Engineering (3 Credits)
The basic concepts of life safety, water-based fire protection systems, building construction, codes and standards along with tenability, fire behavior, and human behavior are introduced along with traditional and performance-based approaches for analyzing human response to fire. Students learn to analyze the egress systems and design basic water-based fire suppression systems.
Additional Information: Highly recommended to incoming graduate students to Fire Protection Engineering who have not earned a Bachelor's Degree in Fire Protection Engineering.

ENFP610 Advanced Special Hazard Suppression Systems (3 Credits)
Issues related to the suppression of fires and the design of fire suppression systems. Theoretical aspects of fire suppression and extinction are considered to provide the foundation for the practical design of different types of fire suppression systems. Focus on water-based and "clean agent" fire suppression systems, with emphasis on high challenge and special hazard applications. Systems using other agents are introduced, but are not addressed in detail.
Jointly offered with: ENFP410.
Credit Only Granted for: ENFP410, ENFP610 or ENFP653.

ENFP611 Fire Induced Flows (3 Credits)
Theoretical basis is presented for fire induced bouyancy driven flows. Plumes, ceiling jets, vent flows, compartment flows. Dimensional analysis for correlations and scale model applications. Smoke movement and combustion products.
Prerequisite: ENFP415.

ENFP613 Advanced Life Safety Analysis (3 Credits)
Fractional effective dose (FED) methods for predicting time to incapacitation and death of fires for use in fire safety engineering calculations. Physiology and toxicology of fire effluent components, decomposition chemistry of common materials, standard experimental approaches. Predictive models of material production rates. People movement characteristics related to building evacuation. Formulation and application of evacuation models. Human behavior factors affecting response of people to fire situations.
Restriction: Permission of ENGR-Fire Protection Engineering department.
Credit Only Granted for: ENFP413 or ENFP613.

ENFP619 Graduate Seminar (1-3 Credits)
Prerequisite: Permission of ENGR-Fire Protection Engineering department.
Restriction: Must be in ENGR: MS Only-Fire Protection Engineering (Master's) program.
Repeatable to: 3 credits.

ENFP620 Fire Dynamics Laboratory (3 Credits)
Laboratory experiments are designed to illustrate fire phenomena and test theoretical models. Diffusion flames, ignition and flame spread on solids, liquid pool fires, wood crib fires, fire plumes, compartment fires.
Recommended: ENFP415.

ENFP621 Analytical Procedures of Structural Fire Protection (3 Credits)
Analysis procedures for structural components of wood, steel, concrete, composites. Structural capabilities, modifications under fire induced exposures. Calculations, computer models for predicting fire resistance ratings of structural components.
Prerequisite: ENFP312. Cross-listed with ENFP621.
Credit Only Granted for: ENFP405 or ENFP621.

ENFP625 Advanced Fire Modeling (3 Credits)
Validity, utility, reliability of current computer models. Applications of models in risk assessment, underwriting, loss prediction, hazard analysis. Development and validation of specific application models.
Prerequisite: Permission of ENGR-Fire Protection Engineering department.

ENFP626 Computational Fire Modeling (3 Credits)
Introduction to Computational Fluid Dynamics (CFD)-based fire modeling; governing equations of turbulent reacting flows; numerical approaches to the treatment of turbulence (DNS, LES, RANS); numerical methods for partial differential equations; physical modeling of enclosure fires (turbulence, combustion, thermal radiation, pyrolysis, suppression). Development of sample programs (Matlab) and use of current CFD-based fire models (FDS).
Prerequisite: ENFP300 and ENFP312.
Restriction: Permission of ENGR-Fire Protection Engineering department.

ENFP627 Advanced Smoke Management and Fire Alarm Systems (3 Credits)
Analysis of hazard smoke. Response analysis of smoke detectors based on characteristics of detectors and properties of smoke. Performance characteristics and limitations of smoke management systems. Capabilities and limitations of analytical design aids.
Prerequisite: ENFP300.
Jointly offered with: ENFP440.
Credit Only Granted for: ENFP627 or ENFP440.

ENFP629 Selected Topics (3-6 Credits)
Current research, studies in fire protection engineering. Future trends and significant changes in research, professional areas. The professional standards process.
Prerequisite: Permission of ENGR-Fire Protection Engineering department.
Restriction: Must be in ENGR: MS Only-Fire Protection Engineering (Master's) program.
Repeatable to: 6 credits.

ENFP630 Diffusion Flames and Burning Rate Theory (3 Credits)
Basic principles of diffusion flames for gaseous, liquid, and solid fuels. Droplet burning, B number, jet combustion, boundary layer combustion, generalized methods.
Prerequisite: ENFP312.

ENFP649 Special Problems (1-3 Credits)
Advanced topics selected by the faculty from the current literature to suit the special needs and background of students, or for individual students who have definite plans of individual study.
Restriction: Must be in ENGR: MS Only-Fire Protection Engineering (Master's) program; and permission of instructor; and permission of ENGR-Fire Protection Engineering department.
Repeatable to: 6 credits if content differs.

ENFP651 Advanced Fire Dynamics (3 Credits)
A review of the basic chemistry and physics necessary to understanding fire dynamics; and of the physics of heat transfer and turbulent fluid flow will be given. The nature and structure of premixed and diffusion flames will be presented.
Prerequisite: ENFP312.
Jointly offered with: ENFP415.
Credit Only Granted for: ENFP629A, ENFP651 or ENFP415.
Formerly: ENFP629A.

ENFP652 Fire Assessment Methods (3 Credits)
This on-line course offers a comprehensive review of experimental techniques to assess fire performance characteristics of materials, products and assemblies.
Credit Only Granted for: ENFP629B or ENFP652.
Formerly: ENFP629B.

ENFP653 Advanced Fire Suppression (3 Credits)
Issues related to the suppression of fires and the design of fire suppression systems. Theoretical aspects of fire suppression and extinction are considered to provide the foundation for the practical design of different types of fire suppression systems. Focus on water-based and "clean agent" fire suppression systems, with emphasis on high challenge and special hazard applications. Systems using other agents are introduced, but are not addressed in detail.
Restriction: Permission of ENGR-Fire Protection Engineering department.
Credit Only Granted for: ENFP410, ENFP610, or ENFP653.

ENFP655 Smoke Control (3 Credits)
Introduces the student to smoke control needs, design approaches and analytical methods. Students should develop an understanding of the performance characteristics and limitations of smoke control systems and the capabilities and limitations of analytical design aids. This course gives students an opportunity to integrate a broad range of information from previous courses with material from this course, such as fluid mechanics, heat transfer, and fire dynamics, and fire modeling. Students will review data from past experimental programs and apply computer model(s).
Restriction: Permission of Maryland Applied Graduate Engineering.

ENFP656 Fire and Explosion Hazards of Battery Energy Storage Systems (3 Credits)
An overview of fire and explosion hazards related to Battery Energy Storage Systems (BESS). Current testing standards and methodologies will be discussed to understand how to quantify the expected hazards. Information on existing and evolving codes and standards will be provided to understand the associated risk and mitigation strategies using both prescriptive and performance-based methodologies. Public information from historic incidents involving BESS will be reviewed to understand the failure modes at the system level. Practical guidance will be provided for forensics analysis of fire and explosion incidents involving BESS.
Restriction: Restricted to students in ENFP, PMFP, ENGF, Z049 and Maryland Applied Graduate Engineering programs.

ENFP661 Forensic Fire Analysis (3 Credits)
This on-line course addresses the forensic analysis of structural fire incidents in terms of enclosure fire dynamics and the impact of fire safety subsystems used to prevent or mitigate the consequences of fire. These subsystems include: ignition prevention, material flammability and flame spread, fire detection and alarm, fire suppression, smoke movement and management, structural fire protection and egress systems. Failures in these subsystems are addressed in terms of differences between expected and observed performance.
Credit Only Granted for: ENFP629D or ENFP661.
Formerly: ENFP629D.

ENFP662 Performance Based Design (3 Credits)
The development of fire protection solutions can involve methods to comply with prescriptive requirements in codes or may incorporate some aspects which follow a performance-based approach. Following a description of the codes and standards process in the U.S., a review of the requirements for structural fire protection are discussed as an example, beginning with prescriptive approaches and ending with performance-based alternatives. The latter half of the course describes the methodology and motivation for performance-based design solutions. Case studies are presented to illustrate the design solutions achieved following the two approaches.
Credit Only Granted for: ENFP629E or ENFP662.
Formerly: ENFP629E.

ENFP663 Advanced Fire Risk Modeling (3 Credits)
This on-line course addresses the fundamentals of fire risk modeling from both theoretical and applied perspectives.
Credit Only Granted for: ENFP629R or ENFP663.
Formerly: ENFP629R.

ENFP664 Advanced Industrial Fire Safety (3 Credits)
This class is designed to introduce students to the basics of process safety with a focus on the methods and techniques that may be utilized when evaluating the existing or proposed safety protection solutions in industrial facilities. An emphasis is placed on properly identifying the hazards that are present, the risk exposure, and how best to address the risk. The foundation is laid by presenting the necessary background information on industrial processes and integrating this information with applicable fire/explosion safety science.Jointly offered with ENFP464.
Credit Only Granted for: ENFP489I, ENFP62 9I, ENFP464, or ENFP664.
Formerly: ENFP489I and ENFP629I.

ENFP665 Advanced Fire and Explosion Investigations (3 Credits)
This course covers many advanced aspects of fire and explosion investigation and reconstruction. Information on field techniques, applicable standards, and best practices are presented with an emphasis on how advanced fire science and fire dynamics can be applied to forensic analysis. Experiments are performed and analyzed to demonstrate the concepts.
Jointly offered with: ENFP465.
Restriction: Permission of the Fire Protection Engineering department.
Credit Only Granted for: ENFP629N, ENFP489N, ENFP465, or ENFP665.
Formerly: ENFP629N.

ENFP667 Advanced Wildland Fires: Science and Applications (3 Credits)
Introduction to the global problem of wildland fires with an overview of the social, political and environmental issues posed as well as detailed coverage of the science, technology and applications used to predict, prevent and suppress wildland fires.
Prerequisite: ENFP312.
Restriction: Permission of ENGR-Fire Protection Engineering department.
Credit Only Granted for: ENFP489W, ENFP629W, or ENFP467.
Formerly: ENFP629W.

ENFP671 Material Flammability (3 Credits)
Introduction to the science and technology of polymeric materials. Standard methods for assessment of fire hazards associated with these materials are reviewed. Fundamental mechanisms defining polymer combustion in various scenarios are elucidated.
Recommended: Completion of ENFP415 or ENFP651 and ENFP320 or ENFP420 recommended.
Restriction: Permission of ENGR-Fire Protection Engineering department.
Credit Only Granted for: ENFP629M or ENFP671.
Formerly: ENFP629M.

ENFP799 Master's Thesis Research (1-6 Credits)
Development and completion of Master's Thesis.
Prerequisite: Permission of ENGR-Fire Protection Engineering department.
Recommended: Completion of ENFP graduate requirements.
Repeatable to: 6 credits.

ENGL - English

ENGL402 Chaucer (3 Credits)
Explore the works of Geoffrey Chaucer in their literary and cultural environment. Texts read in Middle English. Readings may include Canterbury Tales, Troilus and Criseyde, dream visions, and lyric poems.
Prerequisite: Two English courses beyond Fundamental Studies; or permission of ARHU-English Department.

ENGL403 Shakespeare: The Early Works (3 Credits)
Close study of selected works from the first half of Shakespeare's career. Generic issues of early histories, comedies, tragedies. Language, theme, dramatic technique, sources, and early modern English social-historical context.
Prerequisite: Two English courses beyond Fundamental Studies; or permission of ARHU-English Department.

ENGL404 Shakespeare: The Later Works (3 Credits)
Close study of selected plays from the second half of Shakespeare's career. Generic issues of later tragedies, later comedies, romances. Language, theme, dramatic technique, sources, and early modern English social-historical context.
Prerequisite: Two English courses beyond Fundamental Studies; or permission of ARHU-English Department.

ENGL408 Literature by Women Before 1800 (3 Credits)
Selected writings by women in the medieval and early modern era.
Prerequisite: Must have completed two English courses in literature; or permission of the Harriet Tubman Department of Women, Gender, and Sexuality Studies.
Cross-listed with: WGSS408.
Repeatable to: 9 credits if content differs.
Formerly: WMST408.

ENGL409 Study Abroad Special Topics IV (1-6 Credits)
Special topics course taken as part of an approved study abroad program.
Repeatable to: 15 credits if content differs.

ENGL410 Edmund Spenser (3 Credits)
Explore the works of Edmund Spenser in their literary and cultural environment. Special attention to The Faerie Queene; also sonnets and lyric poetry.
Prerequisite: Two English courses beyond Fundamental Studies; or permission of ARHU-English Department.

ENGL412 The Idea of Change in 17th-Century British Literature (3 Credits)
Explore the idea of change--from small adjustments in perspective to political revolutions--in the seventeenth century. We will take up literary experiments such as Edmund Spenser's terrifying vision of cosmic mutability in The Faerie Queene, John Donne's awareness of his vulnerable body as he endures the various stages of an illness, and Margaret Cavendish's embrace of science fiction to imagine new configurations of social life. Topics might include the Reformation and its aftermath; the scientific revolution; the English civil wars; the experience of religious conversion; shifting ideas of race and ethnicity; transatlantic travel and colonial expansion; the idea of "progress" and resistance to it; the agency of women in literary culture and political struggle; changing norms around sexual behavior and identity; and the unstable idea of literature itself. Authors may include Montaigne, Shakespeare, Jonson, Donne, Herbert, Galileo, Marvell, Hooke, Cavendish, Behn, and Milton.
Prerequisite: Two English courses beyond Fundamental Studies; or permission of ARHU-English Department.

ENGL414 Milton (3 Credits)
Explore the works of John Milton in their literary and cultural environment. Poetry and major prose, with special attention to Paradise Lost. Other works may include Samson Agonistes and shorter poems.
Prerequisite: Two English courses beyond Fundamental Studies; or permission of ARHU-English Department.

ENGL416 18th-Century British Literature and Culture (3 Credits)
The literatures of the Enlightenment grappled with a sea change in the understanding of humans, commodities, the planet, non-human animals, the body, newly-encountered "others," and God. Once called the "Age of Reason," novels, plays, and philosophy from this period in fact plumb passions, emotions, and sentiments through plots about love, exploitation, envy, crime, desire, and ambition. Satirists mocked everything from colonialism to virtue claims to satire itself. Read works that transformed what it meant to love, resist, exploit, and desire. Paradoxically, this "Age of Passions" elevated sympathy in the crucible of capitalism, invented human rights in the context of Empire; and formulated racial categories on the road to abolition and religious toleration. Authors might include Daniel Defoe, Eliza Haywood, Lady Mary Wortley Montagu, Bernard Mandeville, Jonathan Swift, Alexander Pope, Aphra Behn, William Congreve, Olaudah Equiano, and others.
Prerequisite: Two English courses beyond Fundamental Studies; or permission of ARHU-English Department.

ENGL420 British Romantic Literature and Culture (3 Credits)
Explore a time (roughly 1780-1830) of great change, political revolution, empire-building, changing economic and sexual relations, and philosophical innovation. Arguably, many of our contemporary notions about literature and what an author is were created during this period. Consider the influence of these changes in such authors as Blake, Wordsworth, Coleridge, Shelley, Keats, Byron, Godwin, Wollstonecaft, Austen, and more.
Prerequisite: Two English courses beyond Fundamental Studies; or permission of ARHU-English Department.

ENGL422 Empire, Urbanization, Aesthetics: Literature of the Global Victorian Era (3 Credits)
An age of cultural, political, and aesthetic upheaval, the Victorian period was a time of enormous social change: working-class agitation, struggles for women's rights, industrialization, imperial aggression, scientific discovery, and shifting ideas about race and colonialism. Through the study of novels, poems, and non-fiction prose, this course will consider how literature of the British nineteenth century engages with the disordered age in which it was composed. Authors may include Charles Dickens, Elizabeth Gaskell, Elizabeth Barrett Browning, George Eliot, Alfred Tennyson, and Mary Seacole, among others.
Prerequisite: Two English courses beyond Fundamental Studies; or permission of ARHU-English Department.

ENGL425 Identity, Acceleration, Revolt: British and Postcolonial Literatures Since 1900 (3 Credits)
Examine the innovations of modern and contemporary Anglophone literature in the midst of war and globalization, gender and sexual revolution, decolonization and shifting nationalisms, and technological and economic transformation. Authors might include Virginia Woolf, James Joyce, Derek Walcott, Salman Rushdie, Jeanette Winterson, and Chimamanda Ngozi Adichie.
Prerequisite: Two English courses beyond Fundamental Studies; or permission of ARHU-English Department.

ENGL428 Seminar in Language and Literature (3 Credits)
Topics will vary each semester. The course will provide a seminar experience in material or methodologies not otherwise available to the major.
Restriction: Junior standing or higher; and must be in the English Honors program or gain permission from the department.
Repeatable to: 12 credits if content differs.

ENGL429 Independent Research in English (1-6 Credits)
An advanced independent research project for qualified students, supervised by an English faculty member, on a topic not ordinarily covered in available courses.
Prerequisite: ENGL301; and two English courses (excluding fundamental studies requirement); and permission of ARHU-English department.
Restriction: Sophomore standing or higher.
Repeatable to: 9 credits if content differs.

ENGL430 Literature of the Americas from First Contact to Revolution (3 Credits)
Examines the literature of the cultural encounters, colonialisms, empires, and independence movements in the early Americas from 1492 through the eighteenth century. Writers typically include Christopher Columbus, John Smith, Anne Bradstreet, Jonathan Edwards, William Byrd, Olaudah Equiano, Phillis Wheatley, and Benjamin Franklin.
Prerequisite: Two English courses beyond Fundamental Studies; or permission of ARHU-English Department.

ENGL431 American Literature: Revolution to Civil War (3 Credits)
An examination of nationalism, sentimentalism, and romanticism, with writings focusing on such topics as slavery and democracy during the 1770s to 1860s. Authors typically include Ralph Waldo Emerson, Margaret Fuller, Emily Dickinson, Walt Whitman, Frederick Douglass, Harriet Beecher Stowe, Edgar Allan Poe, Nathaniel Hawthorne, and Herman Melville.
Prerequisite: Two English courses beyond Fundamental Studies; or permission of ARHU-English Department.

ENGL432 American Literature: 1865 to 1914, Realism and Naturalism (3 Credits)
Reconstruction, Realism, Naturalism. Representative writers such as Dickinson, James, Dreiser.
Prerequisite: Two English courses beyond Fundamental Studies; or permission of ARHU-English Department.

ENGL433 American Literature: 1914 to the Present, the Modern Period (3 Credits)
Modernism, Postmodernism. Writers such as Stevens, Stein, Ellison.
Prerequisite: Two English courses beyond Fundamental Studies; or permission of ARHU-English Department.

ENGL435 American Poetry: Beginning to the Present (3 Credits)
Selections of American poetry, from Bradstreet to contemporary free verse. Authors such as Whitman, Dickinson, Bishop, Hughes, Rich, and Frost.
Prerequisite: Two English courses beyond Fundamental Studies; or permission of ARHU-English Department.

ENGL437 Contemporary American Literature (3 Credits)
Prose, poetry, drama of living American writers. Current cultural and social issues.
Prerequisite: Two English courses beyond Fundamental Studies; or permission of ARHU-English Department.

ENGL438 Selected Topics in Media Studies (3 Credits)
Advanced study of a topic pertinent to how the material production, technologies, and cultural practices of diverse types of media shape meaning.
Prerequisite: Two English courses beyond Fundamental Studies; or permission of ARHU-English department.
Recommended: At least one prior course in Media Studies.
Repeatable to: 9 credits if content differs.

ENGL439 Spotlight on Major Writers (3 Credits)
An intensive study of a single writer, or a handful of writers, to understand the shifts in the writer's craft and cultural influence, both past and present.
Prerequisite: Two English courses beyond Fundamental Studies; or permission of ARHU-English Department.
Repeatable to: 9 credits if content differs.

ENGL440 The Novel in America to 1914 (3 Credits)
Survey of the American novel to World War I. Cultural and philosophical contexts; technical developments in the genre. Authors such as Melville, Wells Brown, James, Sedgwick, Chopin.
Prerequisite: Two English courses beyond Fundamental Studies; or permission of ARHU-English Department.

ENGL444 Feminist Critical Theory (3 Credits)
Issues in contemporary feminist thought that have particular relevance to textual studies, such as theories of language, literature, culture, interpretation, and identity.
Prerequisite: WMST200, WGSS200, WMST250, WGSS250, or ENGL250.
Cross-listed with: WGSS444.
Credit Only Granted for: ENGL444, WMST444 or WGSS444.
Formerly: WMST444.

ENGL446 Post-Modern British and American Poetry (3 Credits)
British and American poets from the 1930s to the present. Such poets as Auden, Williams, Plath, Brooks, Lowell, Wolcott, Ted Hughes, Bishop, Larkin, Jarrell, and Berryman.
Prerequisite: Two English courses beyond Fundamental Studies; or permission of ARHU-English Department.

ENGL448 Literature by Women of Color (3 Credits)
Literature by women of color in the United States, Britain, and in colonial and post-colonial countries.
Prerequisite: Must complete two English courses in literature; or permission of the Harriet Tubman Department of Women, Gender, and Sexuality Studies.
Cross-listed with: WGSS448.
Repeatable to: 9 credits if content differs.
Formerly: WMST448.

ENGL449 Selected Topics in U.S. Latinx Literature (3 Credits)
Advanced study of selected works by U.S. Latinx writers.
Prerequisite: Two English courses beyond Fundamental Studies; or permission of ARHU-English Department.
Repeatable to: 9 credits if content differs.

ENGL452 Restoration and 18th-Century British Drama (3 Credits)
Explore Restoration and 18th-century British drama, with attention to the history of gender, sexuality, capitalism, empire, philosophy, and race. Learn about tragedy, comedy, farce, parody, and burlesque, as well as dramatic and verbal wit.
Prerequisite: Two English courses beyond Fundamental Studies; or permission of ARHU-English Department.

ENGL453 Critical Theory in English Studies (3 Credits)
Examines our assumptions about literature, language, media, and culture by exploring how people have theorized key concepts and relations like language, materiality, meaning, representation, identity, and power. We will focus both on learning the history, arguments, and vocabularies of these theories and on evaluating their usefulness for helping us to understand the many kinds of texts (visual, aural, etc.) we study in English. Theoretical thinking will aid us in analyzing the forms texts take; the ideas texts record, challenge, or reinvent; and how texts make us think or feel about ourselves, others, and the world in which we live.
Prerequisite: Two English courses beyond Fundamental Studies; or permission of ARHU-English Department.

ENGL454 Modern Drama (3 Credits)
The history of modern British drama, from its roots in Chekhov and Ibsen, through the modernisms of Samuel Beckett and Bertolt Brecht, through the Angry Young Men of the 1950s, and right up to the present. Most plays will be from the last 40 years, by writers such as David Hare, Tom Stoppard, Lucy Kirkwood, Caryl Churchill, Roy Williams, Lucy Prebble, Alan Bennett, Brian Friel, Terrence Rattigan, Kwame Kwei-Armah, Sarah Kane, and Alice Birch. We will also look at how class, money, immigration, and the end of the Empire changed British plays over time. And we will consider modern theater architecture and production design as well as the directing instincts of, for instance, Peter Brook, Katie Mitchell, Marianne Elliott, and Nicholas Hytner.
Prerequisite: Two English courses beyond Fundamental Studies; or permission of ARHU-English Department.

ENGL455 The 18th-Century British Novel (3 Credits)
Explore the beginnings of the novel in the late seventeenth and eighteenth centuries. Whether set in exotic locales, rural English homes, or the metropolis of London, novels represented reputedly "ordinary" people--often adolescents--and their daily lives. But what constituted a novel and how it influenced readers was debated throughout the century, and even its name ("novel," "romance," "history," "moral tale") was fluid. The novels we will consider are experimental, adventurous, and metafictional, and they will provoke us to evaluate what we expect of the genre, how it functions, and its aesthetic and cultural stakes. Authors may include Aphra Behn, Daniel Defoe, Eliza Haywood, Samuel Richardson, Henry Fielding, Laurence Sterne, Frances Burney, and Sarah Scott.
Prerequisite: Two English courses beyond Fundamental Studies; or permission of ARHU-English Department.

ENGL457 The Modern Novel (3 Credits)
Explore the remarkable development and transformation of the novel in the twentieth century. Learn about the development of the novel through realism, modernism, and postmodernism, from the transformations made by major modernists like Joseph Conrad, James Joyce, Virginia Woolf, Jean Toomer, William Faulkner, and Katherine Ann Porter to playful, unusual and fascinating postmodern and contemporary fiction by Ralph Ellison, Kathy Acker, Salman Rushdie, Toni Morrison, and others.
Prerequisite: Two English courses beyond Fundamental Studies; or permission of ARHU-English Department.

ENGL458 Literature by Women After 1800 (3 Credits)
Selected writings by women after 1800.
Prerequisite: Must have completed two English courses in literature; or permission of Harriet Tubman Department of Women, Gender, and Sexuality Studies.
Cross-listed with: WGSS458.
Repeatable to: 9 credits if content differs.
Formerly: WMST458.

ENGL459 Selected Topics in LGBTQ+ Literatures and Media (3 Credits)
Advanced study of a topic pertinent to literary and cultural expressions of LGBTQ+ identities, positionalities, and analytics through an exploration of literature, art, and/or media.
Prerequisite: Two English courses beyond Fundamental Studies; or permission of ARHU-English Department.
Repeatable to: 9 credits if content differs.

ENGL460 Archival Research Methods in English Studies (3 Credits)
Introduces approaches for doing archival research in English studies, exploring how researchers develop their scope and practices of study and how they access and use archival materials electronically and on site to further their research questions. Investigates a historical period, genre, or theme through the lens of manuscripts, ephemera, and other artifacts. Case studies vary by semester.
Prerequisite: Two English courses beyond the Fundamental Studies courses; or permission of ARHU-English Department.

ENGL461 Researching Literacy and Language (3 Credits)
Gain practical research experience as you learn to do qualitative research in literacy, writing, and language studies. Study reading, writing, and composing in a variety of contexts (for example, social media and other digital spaces, classrooms, writing centers, churches, workplaces or other community sites). Learn to design and conduct ethical, responsible research studies. Learn to collect data through methods such as interview, observation, and survey and to analyze that data through a variety of methods. Finally, learn to present your research through genres such as reports, posters, and/or presentations.
Prerequisite: Students must have satisfied Fundamental Studies Academic Writing requirement.
Credit Only Granted for: ENGL488R or ENGL461.
Formerly: ENGL488R.

ENGL462 Folksong and Ballad (3 Credits)
Explore America's diverse folksong heritage and its impact on world culture. Learn about such regional, ethnic, and popular music forms as ballad, country, bluegrass, blues, rock, gospel, soul, rap, and zydeco within their specific cultural contexts and as commercial products commodified by a voracious music industry. While we will consider the European and African roots of many of these musical traditions, our focus will be on American contributions in the twentieth century. Reading and listening will focus on genres such as blues or bluegrass; particular artists such as Bessie Smith, Robert Johnson, Bill Monroe, and Louis Jordan; and major figures in the recording industry or fieldworker collectors such as Alan Lomax.

ENGL463 Narrative Analysis Methods in English Studies (3 Credits)
Approaches to literary narrative analysis. Explores narrative theory as a research method for studying the fundamental categories of literary narrative--such as the narrator, character, plot, closure, and frames, as well as the nature of fictionality and the role of the reader--and for interpreting their deployment in individual literary works. We will use this method to examine particularly unusual and even radical fiction, so we can understand the meaning-making work accomplished by narrative form.
Prerequisite: Two English courses beyond Fundamental Studies; or permission of ARHU-English department.

ENGL466 Arthurian Legend (3 Credits)
Development of Arthurian legend in English and continental literature from Middle Ages to twentieth century. All readings in modern English.
Prerequisite: Two English courses beyond Fundamental Studies; or permission of ARHU-English Department.

ENGL467 Creative Approaches to Digital Textuality (3 Credits)
Examines electronic literature and other aspects of the literary world online with a focus on experimental writing with computers. Topics may include digital fiction and storytelling, bots, book hacking, flash fiction, narrative in games, and artificial-intelligence-generated fiction, poetry, and art. No programming experience required.
Prerequisite: One English course beyond Fundamental Studies; or permission of ARHU-English department.

ENGL468 Selected Topics in Film Studies (3-9 Credits)
Advanced studies in various periods and genres of film.
Prerequisite: ENGL245, FILM245, CINE245, FILM283, or SLLC283; or permission of ARHU-English department.
Recommended: ENGL329, CMLT280, and ENGL245.
Repeatable to: 9 credits if content differs.

ENGL469 The Craft of Literature: Creative Form and Theory (3 Credits)
Examines various forms of poetry and/or fiction, emphasizing the practice of making literary art and the aesthetic and theoretical approaches that define it. Students will practice the elements of literary craft, producing and experimenting with a wide range of forms and conventions in poetry and/or fiction. They will also produce critical work that articulates and contextualizes theoretical approaches to the making of literary art.
Prerequisite: 2 ENGL courses in literature or creative writing; and have completed a 200-level creative writing workshop in ENGL. Or permission of ARHU-English department.
Repeatable to: 9 credits if content differs.

ENGL470 African-American Literature: From Slavery to Freedom (3 Credits)
Examines African-American literature from its beginnings to the early twentieth century, including genres ranging from slave narratives, pamphlets, essays, and oratory, to poetry and fiction. Our emphasis is on the interaction between literature and literary forms, on the one hand, and historical and political developments in the push toward emancipation, on the other.
Prerequisite: Two English courses beyond Fundamental Studies; or permission of ARHU-English Department.

ENGL471 African-American Literature: 1910-1945 (3 Credits)
Emergence of modernism in African-American writing including debates over the definition of unique African-American aesthetics, with emphasis on conditions surrounding the production of African-American literatures.
Prerequisite: Two English courses beyond Fundamental Studies; or permission of ARHU-English Department.

ENGL472 African-American Literature: 1945 to Present (3 Credits)
Transformation of African-American literatures into modern and postmodern forms. Influenced by World War II and the Civil Rights and Black Power movements, this literature is characterized by conscious attempts to reconnect literary and folk forms, the emergence of women writers, and highly experimental fiction.
Prerequisite: Two English courses beyond Fundamental Studies; or permission of ARHU-English Department.

ENGL475 Postmodern Literature (3 Credits)
Explore the origins and ongoing development of postmodern literature. Learn about the "postmodern condition," such as the collapse of identity, the erasure of cultural and aesthetic boundaries, and the dissolution of life into textuality. Explore art that has come in the wake of postmodernism and has attempted to move beyond it. Readings might include novels and other genres in varied media by Samuel Beckett, Art Spiegelman, Julian Barnes, Colson Whitehead, Ruth Ozeki, Zadie Smith, and others.
Prerequisite: Two English courses beyond Fundamental Studies; or permission of ARHU-English Department.

ENGL477 BookLab (3 Credits)
Historical, imaginative, and experiential introduction to different elements of books and bookmaking, including letterpress printing with traditional lead and wood (movable) type, different techniques for bindings, 3D printing, zines, making altered and treated books, and so on. Class-time will be a mix of discussion and hands-on activity. The course will culminate in each student designing and creating their own book object, which might take the form of an artist's book, chapbook, zine, an altered or treated book, or something else entirely. Taught with the resources and facilities available in the English department's BookLab.
Prerequisite: Two English courses beyond Fundamental Studies; or permission of ARHU-English Department.
Credit Only Granted for: ENGL428M, ENGL438P, ENGL479P, or ENGL477.
Formerly: ENGL428M, ENGL438P, ENGL479P.

ENGL478 Selected Topics in Literature before 1800 (3 Credits)
Advanced study of key topics in literary works from earlier historical periods.
Prerequisite: Two English courses beyond Fundamental Studies; or permission of ARHU-English Department.
Repeatable to: 9 credits if content differs.

ENGL479 Selected Topics in Literature after 1800 (3 Credits)
Advanced study of key topics in literary works from later historical periods.
Prerequisite: Two English courses beyond Fundamental Studies; or permission of ARHU-English Department.
Repeatable to: 9 credits if content differs.

ENGL482 History of the English Language (3 Credits)
Examines the origins and development of the English language.
Prerequisite: ENGL280, LING200, or HESP120; or permission of ARHU-English department.

ENGL483 American English(es) (3 Credits)
Examines the diversity of dialects, registers, and jargons of English found in the United States, as well as their origins, structures, and functions in society.
Prerequisite: LING200, ENGL280, or HESP120; or permission of ARHU-English department.

ENGL484 Style and Grammar in Written English (3 Credits)
The linguistic analysis of written texts. Examines grammatical and discursive constructions above the level of the sentence and their functions in literary and non-literary texts. We will study narrative structure, authorial voice, genre, register, stance, viewpoint, empathy, surprise, and humor in language.
Prerequisite: Students must have satisfied Fundamental Studies Academic Writing requirement.

ENGL487 Principles and Practices of Rhetoric (3 Credits)
A seminar examining foundational concepts and approaches in the theory and practice of rhetoric in civic, professional, academic, and interpersonal settings; focusing on key issues in persuasion, argumentation, and eloquence in historical and contemporary contexts.
Prerequisite: Students must have satisfied Fundamental Studies Academic Writing requirement.

ENGL488 Topics in Advanced Writing (3 Credits)
Different genres of technical and professional writing including proposal writing, computer documentation, technical report writing, instruction manuals, etc. Students will analyze models of a genre, produce their own versions, test, edit and revise them.
Prerequisite: Students must have satisfied Fundamental Studies Academic Writing requirement.
Repeatable to: 9 credits if content differs.

ENGL489 Special Topics in Language and Rhetoric (3 Credits)
Special topics in language and rhetoric, such as discourse analysis, semantics, or cognitive linguistics; comparative rhetoric and rhetorical theory, digital rhetorics, women's and minority rhetorics, or the history of rhetoric.
Prerequisite: Students must have satisfied Fundamental Studies Academic Writing requirement.
Repeatable to: 9 credits if content differs.

ENGL491 Digital Rhetoric (3 Credits)
Examines the social significance of the ways digital texts are composed and circulated. Explores why it matters how the web is written and who does the writing, understanding the Internet as rhetorical from its content and communities to the code, protocols, and policies that control digital distribution. Includes active experimentation with digital tools so students can expand their theoretical understanding through critical making.
Prerequisite: Students must have satisfied the Fundamental Studies Academic Writing requirement.
Credit Only Granted for: ENGL489J, or ENGL491.
Formerly: ENGL489J.

ENGL492 Graphic Design and Rhetoric (3 Credits)
An exploration of the visual dimensions of texts and the skills involved in designing them well. Considers graphic design theory and history from a rhetorical perspective, working to understand and practice the use of symbol systems to express, inform, and advocate. Includes direct experimentation with the principles and techniques of graphic design.
Prerequisite: Students must have satisfied Fundamental Studies Academic Writing requirement.

ENGL493 Writing Genres as Social Action (3 Credits)
A rhetorical genre studies approach to understanding the work that texts do in the world. Examines issues of identity, power, and medium as they relate to writing in various contexts. Students analyze the texts, context(s), and social significance of a public, professional, digital, and/or advanced academic genre and produce writing that meets, modifies, and subverts expectations.
Recommended: Satisfactory completion of the professional writing requirement (FSPW).
Restriction: Must have earned a minimum of 60 credits.

ENGL494 Editing and Document Design (3 Credits)
Principles of general editing for clarity, precision and correctness. Applications of the conventions of grammar, spelling, punctuation and usage, and organization for logic and accuracy. Working knowledge of the professional vocabulary of editing applied throughout the course.
Prerequisite: One course in Fundamental Studies Professional Writing; or permission of ARHU-English Department.

ENGL495 Independent Study in Honors (1-3 Credits)
Completion and presentation of the senior honors project.
Prerequisite: ENGL373 and ENGL370.
Restriction: Must be in English Language and Literature program; and candidacy for honors in English.

ENGL497 English at Work (3 Credits)
Examines how English majors put their academic knowledge and skills to work in professional workplaces after graduation. Students learn strategies to research careers, and they shadow a person in a career of interest for a day. Students learn to compose different professional genres to write and speak about and for professional development and advancement, including inquiry letters, technical descriptions, professional portfolios, and elevator pitches. Students will critically examine the learning they have done in their undergraduate coursework and compose a vision for bringing that learning to life in their future work.
Prerequisite: ENGL301; and an ENGL course at the 300-level or higher.
Restriction: Must have earned a minimum of 60 credits.

ENGL498 Advanced Fiction Workshop (3 Credits)
An advanced class in the making of fiction. Intensive discussion of students' own fiction. Readings include both fiction and essays about fiction by practicing writers. Writing short critical papers, responding to works of fiction, and to colleagues' fiction, in-class writing exercises, intensive reading, and thinking about literature, in equal parts, and attendance at readings.
Prerequisite: ENGL352; or permission of ARHU-English department.
Repeatable to: 9 credits if content differs.

ENGL499 Advanced Poetry Workshop (3 Credits)
An advanced class in the making of poetry. Intensive discussion of students' own poems. Readings include both poetry and essays about poetry by practicing poets. Writing short critical prose pieces, responding critically to colleagues' poems, in-class and outside writing exercises, and attendance at poetry readings.
Prerequisite: ENGL353; or permission of ARHU-English department.
Repeatable to: 9 credits.

ENGL601 Introduction to Graduate Studies (3 Credits)
An introduction to different elements of graduate work and an exploration of what it means to get a doctoral degree in English. Considers different career trajectories, in and outside of academia, as well as the future of higher education.
Restriction: Must be a student in the Comparative Literature PhD, English MA, or English PhD.

ENGL602 Critical Theory and Literary Criticism (3 Credits)
An introduction to critical theory and literary criticism, with an overview of major movements (including formalism, structuralism and poststructuralism, Marxism, psychoanalysis, and feminism). Designed to help graduate students assess the various ways of approaching and writing about literature.

ENGL609 Technologies of Writing (3 Credits)
ENGL 609 - Technologies of Writing: Readings in the technologies of writing systems, print, and new media.
Restriction: Permission of ARHU-English department.
Repeatable to: 9 credits if content differs.
Additional Information: May fulfill a requirement for the MA in English with a Concentration in Rhetoric and Composition.

ENGL611 Approaches to College Composition (3 Credits)
A seminar emphasizing rhetorical and linguistic foundations for the handling of a course in freshman composition.
Prerequisite: Permission of ARHU-English department.
Additional Information: Required for graduate assistants (optional to other graduate students).

ENGL612 Approaches to Professional and Technical Writing (3 Credits)
A pedagogical approach to professional and technical writing, its history and methodolgy.

ENGL618 Writing for Professionals (3 Credits)
Writing proposals, reports, manuals, policy statements, correspondence, etc. for typical government and business settings. Principles of rhetorical and linguistic analysis and techniques for managing the review process in large organizations.
Repeatable to: 9 credits if content differs.

ENGL619 Readings in Linguistics (3 Credits)
A survey of theoretical and applied linguistics.
Restriction: Permission of ARHU-English department.
Repeatable to: 9 credits if content differs.

ENGL621 Readings in Renaissance English Literature (3 Credits)

ENGL624 Readings in English Romantic Literature (3 Credits)

ENGL626 Readings in American Literature before 1865 (3 Credits)

ENGL628 Readings in African American Literature (3 Credits)

ENGL629 Readings in Folklore, Folklife, and Myth (3 Credits)
Readings pertaining to various genres of folklore and myth such as oral narrative, epic poetry, ballad, folksong, belief, custom and material culture, with special attention given to the history of the study of folklore including fieldwork, interpretation and the political application of these materials. Explores issues of ethnicity, geography, religion, race, gender, and class, as well as the ongoing relations between orality, literacy, print, and other media.
Restriction: Permission of ARHU-English department.
Repeatable to: 6.0 credits if content differs.

ENGL630 Readings in 20th Century English Literature (3 Credits)

ENGL638 Readings in Film as Text and Cultural Form (3 Credits)
An inquiry into theoretical approaches to the cinematic text that include studies of form, culture, reception, ideological formations, historical contextualizations, and the problematics of representation.
Repeatable to: 6 credits if content differs.

ENGL648 Contemporary American Literature (3 Credits)
A survey of American literature in the 21st Century.
Restriction: Permission of ARHU-English department.
Repeatable to: 9 credits.

ENGL649 Readings in Rhetoric, Composition, and Literacy (3 Credits)
Readings in Rhetoric, Composition, and Literacy. Special Topics in the theory and research of rhetoric, composition, and literacy
Restriction: Permission of ARHU-English department.
Repeatable to: 9 credits if content differs.
Additional Information: May fulfill requirement for MA in English with a Concentration in Rhetoric and Composition.

ENGL658 Readings in Multi-Ethnic Literatures of the Americas (3 Credits)
Highlights the cultural diversity of American literatures from various periods, including Latino/a, Native American, Asian American, and African American literatures within and beyond the United States.
Restriction: Permission of English Department.
Repeatable to: 9 credits if content differs.

ENGL659 Readings in Postcolonial Literatures and Theory (3 Credits)
Readings in post-colonial, diasporic, and trans-national theory and literature.
Restriction: Permission of ARHU-English department.
Repeatable to: 6 credits if content differs.

ENGL668 Readings in Modern Literary Theory (3-6 Credits)
Formerly: ENGL666.

ENGL679 Professional and Career Mentoring for Master's Students (1-3 Credits)
Augments advising currently provided by the English Department Graduate Studies Office. Individual professional and career mentoring for MA and MFA students from a faculty member.
Repeatable to: 6 credits if content differs.

ENGL688 Poetry Workshop (3 Credits)
Poetry workshop.
Prerequisite: Permission of ARHU-English department.

ENGL689 Fiction Workshop (3 Credits)
Fiction workshop.
Prerequisite: Permission of ARHU-English department.

ENGL699 Independent Study (1-3 Credits)
Restriction: Permission of instructor; and departmental approval of research project.

ENGL708 Seminar in Rhetoric (3 Credits)
Topics in rhetoric: history of rhetorical theory, modern rhetorical theory, rhetorical interpretation, composition theory, rhetoric of social groups.
Repeatable to: 9 credits if content differs.

ENGL709 Seminar in Transnational Literatures and Cultures (3 Credits)
Examines cultural and political ideas as they circulate across nations in literary and/or other forms (film, song, visual culture, digital works, etc.) in both historical and modern-day contexts.
Cross-listed with: CMLT709.
Restriction: Permission of ARHU-English Department.
Repeatable to: 9 credits if content differs.

ENGL718 Seminar in Medieval Literature (3 Credits)

ENGL719 Seminar in Renaissance Literature (3 Credits)

ENGL728 Seminar in Seventeenth-Century Literature (3 Credits)

ENGL729 Seminar in Eighteenth-Century Literature (3 Credits)

ENGL738 Seminar in Nineteenth-Century Literature (3 Credits)

ENGL739 Seminar in the Digital Humanities (3 Credits)
Examines a broad range of materials, including essays, literature, film, VR, videogames, and other digital texts to engage with and read digital experiences from literary, cultural, and computational perspectives.
Restriction: Permission of the ARHU-English Department.
Repeatable to: 9 credits if content differs.

ENGL748 Seminar in American Literature (3 Credits)

ENGL749 Studies in Twentieth-Century Literature (3 Credits)

ENGL758 Literary Criticism and Theory (3 Credits)

ENGL759 Seminar in Literature and the Other Arts (3 Credits)

ENGL768 Studies in Genre (3 Credits)
Restriction: Permission of ARHU-English department.
Repeatable to: 9 credits if content differs.

ENGL775 Seminar in Composition Theory (3 Credits)
Readings and research in recent theories of effective writing.

ENGL776 Seminar in Modern Rhetorical Theory (3 Credits)
Seminar in Modern Rhetorical Theory. Theories and trends in twentieth and twenty-first century rhetorical theory
Restriction: Permission of ARHU-English department.
Additional Information: May fulfill seminar requirements for MA in English with Concentration in Rhetoric and Composition.

ENGL778 Seminar in Folklore and Myth (3 Credits)
Restriction: Permission of ARHU-English department.
Repeatable to: 6.0 credits if content differs.

ENGL779 Master's Directed Research (1-6 Credits)
This course is for students in the Master's program completing their capstone project.
Repeatable to: 12 credits.

ENGL788 Studies in Poetic Form (3 Credits)
Repeatable to: 9 credits.

ENGL789 Form and Theory in Fiction (3 Credits)
A variety of prose modes (mediations, psychological studies, reportage myths, collage, magic realism, satire, etc.). Some of the writers to be read include Kafka, Cather, Barth, Kundera, and Barthelme.
Prerequisite: Permission of ARHU-English department.

ENGL798 Critical Theory Colloquium (1 Credit)
An intensive advanced exploration of current problems and issues in critical theory.
Prerequisite: A course in critical theory.
Repeatable to: 10 credits if content differs.

ENGL799 Master's Thesis Research (1-6 Credits)

ENGL809 Academic Publishing Worksop (1-2 Credits)
A workshop for the preparation of articles of other critical writing for publication in academic journals or other professional venues.
Restriction: Must be in a major within ARHU-English department; and permission of instructor.
Repeatable to: 8 credits if content differs.
Additional Information: Preference will be given to doctoral students beyond coursework.

ENGL819 Seminar in Themes and Types in English Literature (3 Credits)

ENGL828 Seminar in Themes and Types in American Literature (3 Credits)

ENGL829 Seminar in Postcolonial Literatures (3 Credits)
Postcolonial, transnational, and diasporic literatures in the Anglophone world.
Restriction: Permission of ARHU-English department.
Repeatable to: 6 credits if content differs.

ENGL878 Pedagogical Mentoring for Doctoral Students (1-3 Credits)
Pedagogical mentoring by roster faculty members for graduate students teaching 200-level literature courses.
Repeatable to: 12 credits if content differs.

ENGL879 Professional Mentoring for Doctoral Students (1-3 Credits)
Augments advising currently provided by the English Department Graduate Studies Office. Individual professional and career mentoring for PhD students from a faculty member.
Repeatable to: 12 credits if content differs.

ENGL888 Practicum in English Studies (1 Credit)

ENGL898 Pre-Candidacy Research (1-8 Credits)
Pedagogical mentoring by roster faculty members for graduate students teaching 200-level literature courses.
Repeatable to: 12 credits if content differs.

ENGL899 Doctoral Dissertation Research (1-8 Credits)

ENMA - Engineering, Materials

ENMA400 Introduction to Atomistic Modeling in Materials (3 Credits)
This is an introductory course designed to study atomistic modeling and simulation techniques used in materials research. This course covers the theories, methods, and applications of atomistic-scale modeling techniques in simulating, understanding, and predicting the properties of materials. Specific topics include: molecular statics using empirical force fields; quantum mechanical methods including density functional theory; molecular dynamics simulations; and Monte Carlo and kinetic Monte Carlo modeling.
Prerequisite: ENMA300, MATH206, and ENMA460.
Recommended: Basic knowledge in quantum mechanics (preferred but not required); basic knowledge in statistical mechanics (preferred but not required). Also offered as: ENMA600.
Credit Only Granted for: ENMA489A, ENMA400, ENMA698A, or ENMA600.
Formerly: ENMA489A.

ENMA401 Continuum Modeling of Materials (3 Credits)
Introduces continuum modeling techniques in materials science and engineering. This course covers and emphasizes the applications of continuum modeling techniques using COMSOL software package in simulating a range of materials phenomena and properties. Specific topics of continuum modeling include: The construction and analyses of continuum models using COMSOL software package; Structural mechanics; Heat transfer; Electrical current; Chemical species transport; Fluid flow; Multi-physics models coupling above phenomena.
Prerequisite: ENMA362, PHYS270, PHYS271, and MATH246; or equivalent; and ENMA165 or MATH206.
Restriction: Permission of ENGR-Materials Science & Engineering department.
Credit Only Granted for: ENMA401 or ENMA489C.
Formerly: ENMA489C.

ENMA410 Materials for Energy I (3 Credits)
The goal is to demonstrate the role of materials in solving one of the most critical socio-economic issues of our time, affordable and sustainable energy. There will be a discussion of U.S. and global energy and related environmental issues. Topics covered include: fuel cells and batteries (electrochemical energy conversion and storage); catalysts and membrane separations (fossil fuel and biomass energy conversion); and nuclear fuels.
Prerequisite: Minimum grade of C- in ENMA300; and permission of ENGR-Materials Science & Engineering department.
Credit Only Granted for: ENMA410 or ENMA489H.
Formerly: ENMA489H.

ENMA411 Materials for Energy II (3 Credits)
Demonstrates the role of materials in solving one of the most critical socio-economic issues of our time, affordable and sustainable energy. Materials for Energy is a two-part course based on material functionality; however, they are independent and neither is a prerequisite for the other. Materials for Energy II will focus on electrical, optical, thermal, and mechanically functional materials for energy devices. Solar cells, solar fuel, solar thermal, energy efficient lighting, building energy, thermoelectric and wind energy will be covered.
Prerequisite: Minimum grade of C- in ENMA300; and permission of ENGR-Materials Science & Engineering department.
Credit Only Granted for: ENMA411 or ENMA489I.
Formerly: ENMA489I.

ENMA414 Introduction to Solid State Ionics (3 Credits)
Solid State Ionics is the study of point defects in crystalline and non-crystalline solids; defect equilibria and transport; the influence of chemical and electric potentials, interfaces, and association; and the application of ionically conducting solids in solid-state electrochemical transducer systems and devices.
Prerequisite: ENMA300; and permission of ENGR-Materials Science & Engineering department.
Credit Only Granted for: ENMA414 or ENMA489W.
Formerly: ENMA489W.

ENMA421 Design of Composites (3 Credits)
Fundamentals of design, processing and selection composite materials for structural applications will be covered. The topics include a review of all classes of materials, an in-depth analysis of micro and macro mechanical behavior including interactions at the two-phase interfaces, modeling of composite morphologies for optimal microstructures, material aspects, cost considerations, processing methods including consideration of chemical reactions and stability of the interfaces, and materials selection considerations.
Restriction: Permission of ENGR-Materials Science & Engineering department.
Credit Only Granted for: ENMA421 or ENMA489A.
Formerly: ENMA489A.

ENMA422 Radiation Effects of Materials (3 Credits)
Ionizing radiation, radiation dosimetry and sensors, radiation processing, radiation effects on: polymers, metals, semiconductors, liquids, and gases. Radiation in advanced manufacturing, radiation-physical technology.
Prerequisite: ENMA300; and permission of ENGR-Materials Science & Engineering department.
Credit Only Granted for: ENMA422 or ENMA489E.
Formerly: ENMA489E.

ENMA425 Introduction to Biomaterials (3 Credits)
Examination of materials used in humans and other biological systems in terms of the relationships between structure, fundamental properties and functional behavior. Replacement materials such as implants, assistive devices such as insulin pumps and pacemakers, drug delivery systems, biosensors, engineered materials such as artificial skin and bone growth scaffolds, and biocompatibility will be covered.
Recommended: ENMA300.
Restriction: Permission of ENGR-Materials Science & Engineering department.
Credit Only Granted for: BIOE453, CHBE457, or ENMA425.

ENMA426 Reliability of Materials (3 Credits)
Students are taught the basic degradation mechanisms of materials, through the understanding of the physics, chemistry, mechanics of such mechanisms. Mechanical failure mechanisms concentrate on fatigue, and creep. Chemical failure mechanisms emphasize corrosion and oxidation. Physical mechanisms such as diffusion, electromigration, defects and defect migration, surface trapping mechanisms, charge creation and migration are also included.
Restriction: Permission of ENGR-Materials Science & Engineering department.
Credit Only Granted for: ENMA426 or ENMA489R.
Formerly: ENMA489R.

ENMA431 Nanomechanics of Biomaterials (3 Credits)
Focuses on the latest scientific developments and discoveries in the nanoscale structure and properties of biological materials. The course begins with introductory lectures on the various nanostructures of biomaterials, and their physiological roles under mechanical forces. General aspects of biopolymers, protein folding, and self-assembly are also covered. Next, a series of in-depth lectures are presented on the characterization methods of nanomechanical properties using single molecule techniques. Finally, current applications of nanobiomaterials in the area of molecular machines, molecular self-assembly, and nanoscaffold are discussed.
Prerequisite: ENMA300; and permission of ENGR-Materials Science & Engineering department.
Credit Only Granted for: ENMA431 or ENMA489B.
Formerly: ENMA489B.

ENMA434 Quantum Mechanics for Engineers (3 Credits)
Provides engineering students with a foundational understanding of quantum mechanics and its practical applications in the field of materials science. This course will equip students with the essential knowledge and skills required to harness the principles of quantum mechanics in their pursuit of innovative solutions in materials science and engineering.
Prerequisite: MATH241 and PHYS270.
Restriction: Permission of ENGR-Materials Science & Engineering department.

ENMA435 Wide Bandgap Materials and Devices (3 Credits)
Presents the materials science of wide bandgap materials and analyzes the defects present in such materials from a device performance point of view.
Prerequisite: ENMA300 and ENMA465.
Corequisite: ENMA460.
Jointly offered with: ENMA635.
Restriction: Permission of ENGR-Materials Science & Engineering department.
Credit Only Granted for: ENMA435 or ENMA635.

ENMA436 Introduction to Quantum Materials and Devices (3 Credits)
Quantum materials and devices are an emerging field in materials engineering and physics which offer new approaches to electronics and photonics. This course serves as an introduction to quantum materials and their applications in quantum technologies. It will teach concepts needed to understand the quantum mechanical properties of materials and connect their fundamental properties to quantum device applications. Topics will include low-dimensional materials, strongly correlated electron systems, topology in solids, and light-matter interactions
Prerequisite: ENMA460 and ENMA461 .
Jointly offered with: ENMA636.
Restriction: Permission of ENGR-Materials Science & Engineering department.
Credit Only Granted for: ENMA436 or ENMA636.

ENMA437 Machine Learning for Materials Science (3 Credits)
Familiarizes students with basic as well as state of the art knowledge of machine learning and its applications to materials science and engineering. Covers the range of machine learning topics with applications including feature identification and extraction, determining predictive descriptors, uncertainty analysis, and identifying the most informative experiment to perform next. One focus of the class is to build the skills necessary for developing an autonomous materials research system, where machine learning controls experiment design, execution, and analysis in a closed-loop.
Prerequisite: MATH461, ENMA300, and ENMA165 or equivalent.
Jointly offered with: ENMA637.
Restriction: Permission of ENGR-Materials Science & Engineering department.
Credit Only Granted for: ENMA437 or ENMA637.

ENMA440 Nano Plasma Processing of Materials (3 Credits)
Sustaining mechanisms of plasmas are covered, especially low-pressure electrical gas discharges, fundamental plasma physics, sheath formation, electric and magnetic field effects, plasma-surface interactions in chemically reactive systems, plasma diagnostic techniques and selected industrial applications of low pressure plasmas.
Restriction: Permission of ENGR-Materials Science & Engineering department.
Credit Only Granted for: ENMA440, ENMA489P, ENMA640, or ENMA698P.
Formerly: ENMA489P.

ENMA441 Characterization of Materials (3 Credits)
Techniques to characterize the properties of materials whose characteristic dimensions range from nanometers to macroscopic. These include conventional crystalline and noncrystalline materials, with a special attention to materials of current technological interest. The course will include recent results from the scientific literature.
Prerequisite: ENMA300, ENMA165 or MATH206.
Restriction: Permission of ENGR-Materials Science & Engineering department; and senior standing.
Credit Only Granted for: ENMA489T or ENMA441.
Formerly: ENMA489T.

ENMA443 Phontonic Materials, Devices and Reliability (3 Credits)
The course focuses on the understanding of the basic optical processes in semiconductors, dielectrics and organic materials. The application of such materials in systems composed of waveguides, light emitting diodes and lasers, as well as modulators is developed.
Restriction: Permission of ENGR-Materials Science & Engineering department; and junior standing or higher.
Credit Only Granted for: ENMA443 or ENMA489Z.
Formerly: ENMA489Z.

ENMA445 Liquid Crystals and Structured Soft Materials (3 Credits)
Elective course on the properties and behavior of liquid crystals and related soft materials, and their relationship to biomaterials and to applications.
Prerequisite: MATH246, PHYS270, and PHYS271.
Restriction: Permission of ENGR-Materials Science & Engineering department.
Credit Only Granted for: ENMA445 or ENMA489L.
Formerly: ENMA489L.

ENMA460 Introduction to Solid State Physics (3 Credits)
Classes of materials; introduction to basic ideal and real materials' behavior including mechanical, electrical, thermal, magnetic and optical responses of materials; importance of microstructure in behavior. One application of each property will be discussed in detail.
Prerequisite: PHYS271, PHYS270, and MATH241.
Cross-listed with: PHYS431.
Restriction: Junior standing or higher; and must be in the Engineering: Materials Science program or Physics program.
Credit Only Granted for: ENMA460 or PHYS431.
Additional Information: Materials Engineering students take ENMA460 and Physics students take PHYS431.

ENMA461 Thermodynamics of Materials (3 Credits)
Thermodynamic aspects of materials; basic concepts and their application in design and processing of materials and systems. Topics include: energy, entropy, adiabatic and isothermal processes, internal and free energy, heat capacity, phase equilibria and surfaces and interfaces.
Prerequisite: ENMA300.
Restriction: Junior standing or higher.

ENMA463 Macroprocessing of Materials (3 Credits)
Processing of modern, bulk engineering materials. Raw materials, forming, firing, finishing and joining. More emphasis on metals and ceramics than polymers.
Prerequisite: ENMA300.
Restriction: Junior standing or higher.

ENMA464 Environmental Effects on Engineering Materials (3 Credits)
Introduction to the phenomena associated with the resistance of materials to damage under severe environmental conditions. Oxidation, corrosion, stress corrosion, corrosion fatigue and radiation damage are examined from the point of view of mechanism and influence on the properties of materials. Methods of corrosion protection and criteria for selection of materials for use in radiation environments.
Prerequisite: ENMA300. Or permission of ENGR-Materials Science & Engineering department; and permission of instructor.

ENMA465 Microprocessing Materials (3 Credits)
Micro and nanoscale processing of materials. Emphasis on thin film processing for advanced technologies.
Prerequisite: ENMA300.
Restriction: Permission of ENGR-Materials Science & Engineering department.
Credit Only Granted for: ENMA363, ENMA489B, or ENMA465.
Formerly: ENMA363.

ENMA466 Advanced Materials Fabrication Laboratory (3 Credits)
This course allows students an opportunity to study advanced materials systems in depth through a combination of lectures and hands-on laboratory experiments. Students will be trained in materials processing and characterization techniques. Each student will fabricate materials and devices in our state-of-the-art nanofabrication clean room facility (Fablab), as well as evaluate them using a variety of characterization techniques.
Prerequisite: ENMA465; and permission of ENGR-Materials Science & Engineering department.

ENMA470 Materials Selection for Engineering Design (3 Credits)
Students will learn about materials classes, properties, limitations and applications and the methodology of materials selection in engineering design.
Prerequisite: Permission of ENGR-Materials Science & Engineering department.
Restriction: Junior standing or higher.
Credit Only Granted for: ENMA 470 or ENMA 489O.
Formerly: ENMA 489O.

ENMA471 Kinetics, Diffusion and Phase Transformations (3 Credits)
Fundamentals of diffusion, the kinetics of reactions including nucleation and growth and phase transformations in materials.
Prerequisite: Must have completed or be concurrently enrolled in ENMA461.
Restriction: Junior standing or higher; or permission of ENGR-Materials Science & Engineering department.

ENMA472 Additive Manufacturing of Materials (3 Credits)
Additive manufacturing approaches for metals, ceramics and polymers will be explored in terms of manufacturability and how processing parameters affect microstructure and properties. The course will include projects, including a Terrapin Works project to design and build a part, to develop an understanding of the current state of additive manufacturing, its future promise and its limitations.
Prerequisite: ENMA300.
Restriction: Must be in Engineering: Materials Science program.
Credit Only Granted for: ENMA472 or ENMA672.

ENMA473 Engineering Using High Strength Metals and Alloys (3 Credits)
This is a class focused on the materials engineering challenges of applying high strength metals and alloys to solutions. The extraordinary properties of these alloys derive from (1) highly metastable microstructures, (2) high strengths and melting points of the base metals, (3) complicated processing and fabrication procedures, and (4) their resulting complex behavior in extreme environments. This course will give you the knowledge base you need to select, apply and troubleshoot the performance of high strength metals and alloys in a variety of applications.
Prerequisite: Minimum grade of C- in ENMA300 and permission of ENGR-Materials Science & Engineering department.

ENMA474 Introduction to Computational Materials Science (3 Credits)
This is an introductory course aiming for junior and senior undergraduate students to study atomistic modeling and simulation techniques that are used in materials science. This course covers the theories and applications of atomistic scale modeling techniques to simulate, understand, and predict the properties of materials. Topics include: molecular statics, quantum mechanical methods, molecular dynamics simulations and Monte Carlo simulations.
Restriction: Permission of ENGR-Materials Science & Engineering department.
Credit Only Granted for: ENMA474 or ENMA489A.
Formerly: ENMA489A.

ENMA475 Fundamentals of Diffraction Techniques in Materials Science (3 Credits)
This course looks at the advanced methods of x-ray scattering/diffraction available thanks to the more powerful sources available to us. The availability of these sources enables us to study liquid crystals, polymers, nanomaterials, quasiorganized materials (including nano) and disordered materials.
Prerequisite: MATH246, PHYS270, and PHYS271.
Restriction: Permission of ENGR-Materials Science & Engineering department.
Credit Only Granted for: ENMA475 or ENMA489M.
Formerly: ENMA489M.

ENMA476 NanoManufacturing: Materials Design and Systems Integration (3 Credits)
The fundamentals of nanomanufacturing based on state-of-the-art and future prospects in materials design and systems integration. The course examines functional nanomaterials design and synthesis, structural assembly from nanoscale to macroscale, and device fabrication. Distinct from the current curricular paradigm in many nanotechnology programs that focus on underlying science, this course emphasizes the immediate need for scale-up, process robustness, and system integration issues. Featuring case studies from industry, end of chapter problems, and study questions, the course is for upper-level undergraduate and graduate students, who are interested in the future of manufacturing innovation and technology.
Restriction: Must be in Engineering: Materials Science program.

ENMA481 Introduction to Electronic and Optical Materials (3 Credits)
Electronic, optical and magnetic properties of materials. Emphasis on materials for advanced optoelectronic and magnetic devices and the relationship between properties and the processing/fabrication conditions.
Prerequisite: Minimum grade of C- in ENMA300 and MATH246 .
Recommended: ENMA460 and ENMA465.
Restriction: Permission of ENGR-Materials Science & Engineering department.

ENMA482 Introduction to Electron Microscopy (3 Credits)
An introduction of the basic principles of operation for modern electron microscopes. Details will be given on the construction of microscopes, their basic operation, and the types of questions that can be addressed with an electron microscope. Emphasis will be placed on a conceptual understanding of the underlying theories. Where appropriate, mathematical descriptions will be utilized. Upon completion of this course, students will be excepted to have a basic understanding sufficient to give interpretations of microscopy images and to suggest the correct tool or approach for certain research studies.
Prerequisite: PHYS142, PHYS122, or PHYS260.
Credit Only Granted for: ENMA482 or ENMA489J.
Formerly: ENMA489J.

ENMA486 Seminar in Materials Science and Engineering (1 Credit)
Current research in materials science and engineering and related fields. The lectures are presented by scientists and engineers from academia, national laboratory, US government, etc., in the format of seminars.
Restriction: Must be in Engineering: Materials Science program.

ENMA487 Capstone Preparation (1 Credit)
In preparation for the senior level design course, students will do background research and develop white papers from which teams will form around short listed design projects. The projects should focus on a society, industry, military or technological based problem in Materials Science and Engineering leading to a design and strategy to address the problem in the following course, ENMA 490. The course will include written and oral presentations of the white papers and team proposals.
Restriction: Must be in Engineering: Materials Science program; and senior standing; and permission of ENGR-Materials Science & Engineering department.

ENMA489 Selected Topics in Engineering Materials (3 Credits)
Selected topics of current importance in materials science and engineering.
Restriction: Permission of ENGR-Materials Science & Engineering department.
Repeatable to: 12 credits if content differs.

ENMA490 Materials Design (3 Credits)
Capstone design course. Students work in teams on projects evaluating a society or industry based materials problem and then design and evaluate a strategy to minimize or eliminate the problem; includes written and oral presentations.
Prerequisite: Minimum grade of C- in ENMA487.
Restriction: Senior standing.

ENMA495 Polymeric Engineering Materials I (3 Credits)
Study of polymeric engineering materials and the relationship to structural type. Elasticity, viscoelasticity, anelasticity and plasticity of single and multiphase materials. Emphasis is on polymetric materials.
Prerequisite: ENMA300.
Restriction: Permission of ENGR-Materials Science & Engineering department.

ENMA496 Polymeric Materials: Structure, Property, and Processing (3 Credits)
An intermediate level treatment of structures of polymers. An introduction to mechanical properties and processing of polymeric materials. Emphasis will be on how to establish the structure-property relationship and on how to achieve such understanding via different characterization methods.
Prerequisite: ENMA300; and permission of ENGR-Materials Science & Engineering department.
Cross-listed with: CHBE496.
Credit Only Granted for: ENMA496 or CHBE496.

ENMA499 Independent Undergraduate Research (1-3 Credits)
Students work with a faculty member on an individual laboratory project in one or more of the areas of engineering materials. Students will design and carry out experiments, interpret data and prepare a comprehensive laboratory report.
Restriction: Permission of ENGR-Materials Science & Engineering department; and junior standing or higher; and prior work with the research mentor.
Repeatable to: 6 credits if content differs.

ENMA600 Advanced Atomistic Modeling in Materials (3 Credits)
This is an advanced course designed to study atomistic modeling and simulation techniques used in materials research. This course covers the theories, methods, and applications of atomistic-scale modeling techniques in simulating, understanding, and predicting the properties of materials. Specific topics include: molecular statics using empirical force fields; quantum mechanical methods including density functional theory; molecular dynamics simulations; and Monte Carlo and kinetic Monte Carlo modeling.
Prerequisite: Permission of ENGR-Materials Science & Engineering department.
Credit Only Granted for: ENMA600, ENMA 698A, ENMA400 or ENMA489A.
Formerly: ENMA698A.

ENMA601 Continuum Modeling of Materials (3 Credits)
An introductory course of continuum modeling in materials science and engineering. This course covers and emphasizes the applications of continuum modeling techniques using COMSOL software package in simulating a range of materials phenomena and properties.
Jointly offered with: ENMA401.
Restriction: Permission of ENGR-Materials Science & Engineering department.
Credit Only Granted for: ENMA401, ENMA601 or ENMA698C.
Formerly: ENMA698C.

ENMA613 Materials Science of Quantum Computing (3 Credits)
Quantum computing is the emerging field that attempts to perform information processing on a quantum mechanical state (qubit). This graduate level course targets advanced undergraduate and beginning graduate students for an introduction to this field of applied physics and the related material structures needed for elementary quantum computing. This course focuses on targeted topics of quantum mechanics and solid state physics as applicable to ion trap qubits, electron spin qubits, and superconducting qubits with connections to actual material structures their design and means of fabrication.
Prerequisite: Permission of ENGR-Materials Science & Engineering department.
Recommended: Strongly recommended coursework in introduction to materials science, electronic materials, solid state physics, quantum mechanics and basic knowledge in computer programming or MATLAB.

ENMA614 Advanced Solid State Ionics (3 Credits)
Advanced solid state ionics is the higher level study of point defects in crystalline and non-crystalline solids; defect equilibria and transport; the influence of chemical and electric potentials, interfaces, and association; and the application of ionically conducting solids in solid-state electrochemical transducer systems and devices.
Prerequisite: Permission of ENGR-Materials Science & Engineering department.
Credit Only Granted for: ENMA 614 or ENMA 698W.
Formerly: ENMA 698W.

ENMA620 Polymer Physics (3 Credits)
The thermodynamics, structure, morphology and properties of polymers. Developing an understanding of the relationships between theory and observed behavior in polymeric materials.
Prerequisite: ENMA471; or permission of instructor.
Restriction: Permission of ENGR-Materials Science & Engineering department.

ENMA621 Advanced Design Composite Materials (3 Credits)
Fundamentals of design, processing, and selection of composite materials for structural applications are covered. The topics include a review of all classes of engineering materials, an in-depth analysis of micro and macro mechanical behavior including interactions at the two-phase interfaces, modeling of composite morphologies for optimal microstructures, material aspects, cost considerations, processing methods- including consideration of chemical reactions, stability of the interfaces and material selection.
Restriction: Permission of ENGR-Materials Science & Engineering department.
Credit Only Granted for: ENMA621 or ENMA698A.
Formerly: ENMA698A.

ENMA626 Fundamentals of Failure Mechanisms (3 Credits)
Advanced failure mechanisms in reliability engineering wiil be taught from a basic materials and defects point of view. The methods of predicting the physics of failure of devices, materials, components and systems are reviewed. The main emphasis will be given to basic degradation mechanisms through understanding the physics, chemistry, and mechanics of such mechanisms. Mechanical failures are introduced through understanding fatigue, creep and yielding in materials, devices and components. The principles of cumulative damage and mechanical yielding theory are taught. The concepts of reliability growth, accelerated life testing, environmental testing are introduced. Physical, chemical and thermal related failures are introduced through a basic understanding of degradation mechanisms such as diffusion, electromigration, defects and defect migration. The failure mechanisms in basic material types will be taught. Failure mechanisms observed in real electronic devices and electronic packaging will also be presented. Problems related to manufacturing, and microelectronics will be analyzed. Mechanical failures are emphasized from the point of view of complex fatigue theory.
Cross-listed with: ENRE600.
Credit Only Granted for: ENMA626 or ENRE600.

ENMA627 Nanotechnology Characterization (3 Credits)
Techniques to characterize the properties of materials whose characteristic dimensions are a few to a few hundred nanometers, including "conventional" nanocrystalline materials, but concentrating on "novel" nanomaterials: carbon nanotubes, quantum dots, quantum wires, and quantum wells will be covered. The emphasis is on recent results from the scientific literature concerning those properties that make nanostructures interesting: quantum effects, novel transport phenomena, enhanced mechanical properties associated with localization and with small crystalline size.
Credit Only Granted for: ENMA627 or ENME698T.
Formerly: ENMA698T.

ENMA630 Advanced Nanosized Materials: Synthesis and Utilization (3 Credits)
This course covers fundamental theory and fabrication-related aspects of nanoscale materials science. Topics: Quantization of energy level in solids and its effect on properties. Nucleation, growth and aging. Nano-epitaxy. Anisotropic crystal engineering. Electrical Transport. Nano-magnetism. Properties of carbon nanotubes. Applications in electronics, optics, data storage, energy and biomedicine.
Restriction: Permission of ENGR-Materials Science & Engineering department.
Credit Only Granted for: ENMA630 or ENMA6998G.
Formerly: ENMA698G.

ENMA631 Advanced Nanomechanics of Biomaterials (3 Credits)
Students will develop understanding of the latest scientific developments and discoveries in the nanoscale structure and properties of biological materials. Topics include nanostructures of biomaterials, physiological roles under mechanical forces, biopolymers, protein folding, and self-assembly. Also included are characterization methods of nanomechanical properties using single molecule techniques. Current applications of nanobiomaterials in the area of molecular machines, molecular self-assembly, and nanoscaffold are discussed.
Prerequisite: Permission of ENGR-Materials Science & Engineering department.
Credit Only Granted for: ENMA631 or ENMA698B.
Formerly: ENMA698B.

ENMA633 Advanced Characterization of Soft Matter Materials (3 Credits)
This course is focused on both the theories and experimental works of studying structure and dynamics of soft matter materials using scattering techniques (light, x-ray and neutron scattering). These scattering techniques can probe the structure from a few Angstrom to micrometer and the dynamics from picosecond to second, are thus widely used to reveal the structure-performance relationship of different materials. The course discusses the physics principles of these techniques and explains the details of general theories and commonly used models in characterizing soft matter materials such as polymer, protein, colloidal, thin film, and gel systems.
Cross-listed with: CHPH633.
Restriction: Permission of ENGR-Materials Science & Engineering department.
Credit Only Granted for: ENMA633 or CHPH633.

ENMA635 Wide Bandgap Materials and Devices (3 Credits)
Presents the materials science of wide bandgap materials and analyzes the defects present in such materials from a device performance point of view.
Jointly offered with: ENMA435.
Restriction: Permission of ENGR-Materials Science & Engineering department.
Credit Only Granted for: ENMA435 or ENMA635.

ENMA636 Introduction to Quantum Materials and Devices (3 Credits)
Quantum materials and devices are an emerging field in materials engineering and physics which offer new approaches to electronics and photonics. This course serves as an introduction to quantum materials and their applications in quantum technologies. It will teach concepts needed to understand the quantum mechanical properties of materials and connect their fundamental properties to quantum device applications. Topics will include low-dimensional materials, strongly correlated electron systems, topology in solids, and light-matter interactions.
Prerequisite: ENMA650 and ENMA660 .
Jointly offered with: ENMA436.
Restriction: Permission of ENGR-Materials Science & Engineering department.
Credit Only Granted for: ENMA436 or ENMA636.

ENMA637 Machine Learning for Materials Science (3 Credits)
Familiarizes students with basic as well as state of the art knowledge of machine learning and its applications to materials science and engineering. Covers the range of machine learning topics with applications including feature identification and extraction, determining predictive descriptors, uncertainty analysis, and identifying the most informative experiment to perform next. One focus of the class is to build the skills necessary for developing an autonomous materials research system, where machine learning controls experiment design, execution, and analysis in a closed-loop.
Prerequisite: MATH461.
Recommended: Python knowledge.
Jointly offered with: ENMA437.
Restriction: Permission of ENGR-Materials Science & Engineering department.
Credit Only Granted for: ENMA437, ENMA489L, or ENMA637.

ENMA640 Advanced Nano Processing of Materials with Plasma (3 Credits)
Plasmas are used to control the micro-and Nanoscale level structure of materials including patterning at the micro-and nanoscale level using plasma etching techniques. The course establishes the scientific understanding required for the efficient production of nano-structure using plasma techniques.
Restriction: Permission of ENGR-Materials Science & Engineering department.
Credit Only Granted for: ENMA440, ENMA489P, ENMA698P, or ENMA640.
Formerly: ENMA698P.

ENMA641 Nanotechnology Characterization (3 Credits)
Techniques to characterize the properties of materials whose characteristic dimensions are a few to a few hundred nanometers, including conventional nanocrystalline materials, but concentrating on novel nanomaterials: carbon nanotubes, quantum dots, quantum wires, and quantum wells are covered. The emphasis is on recent results from the scientific literature concerning those properties that make nanostructures interesting: quantum effects, novel transport phenomena, enhanced mechanical properties associated with localization and with small crystallite size.
Restriction: Permission of ENGR-Materials Science & Engineering department.
Credit Only Granted for: ENMA698T or ENMA641.
Formerly: ENMA698T.

ENMA643 Advanced Photonic Materials (3 Credits)
The understanding of the basic optical processes in photonic devices and systems compsed of waveguides, light emitting diodes and lasers, as well as modulators is developed. Lectures on basic degradation mechanisms of such systems will be presented. The area of organic based LED reliability will be covered from the point of view of the stability of the organic-inorganic interface.
Restriction: Permission of ENGR-Materials Science & Engineering department.
Credit Only Granted for: ENMA698Z, ENRE648Z, or ENMA643.
Formerly: ENMA698Z.

ENMA645 Advanced Liquid Crystals and Other Monomeric Soft Matter Materials (3 Credits)
Elective course on the properties and behavior of liquid crystal and related soft materials, and their relationship to biomaterials and applications.
Restriction: Permission of ENGR-Materials Science & Engineering department.

ENMA650 Nanometer Structure of Materials (3 Credits)
The basic concepts required for understanding nanostructured materials and their behavior will be covered. Topics covered include the structural aspects of crystalline and amorphous solids and relationships to bonding types, point and space groups. Summary of diffraction theory and practice. The reciprocal lattice. Relationships of the microscopically measured properties to crystal symmetry. Structural aspects of defects in crystalline solids.
Prerequisite: ENMA460; or students who have taken courses with comparable content may contact the department. And permission of ENGR-Materials Science & Engineering department.

ENMA659 Special Topics in Electronic Materials (3 Credits)
Topics of current interest in the design and manufacture of electronic materials.
Restriction: Permission of ENGR-Materials Science & Engineering department.
Repeatable to: 6 credits if content differs.

ENMA660 Thermodynamics in Materials Science (3 Credits)
Thermodynamics of engineering solids. Thermal, diffusional and mechanical interactions in macroscopic systems. Systems in thermal contact, systems in thermal and diffusive contact, systems in thermal and mechanical contact.
Corequisite: ENMA650.
Restriction: Permission of ENGR-Materials Science & Engineering department.

ENMA661 Kinetics of Reactions in Materials (3 Credits)
The theory of thermally activated processes in solids as applied to diffusion, nucleation and interface motion. Cooperative and diffusionless transformations. Applications selected from processes such as allotropic transformations, precipitation, martensite formation, solidification, ordering, and corrosion.
Prerequisite: ENMA660.
Restriction: Permission of ENGR-Materials Science & Engineering department.

ENMA664 Advanced Environmental Effects on Engineering Materials (3 Credits)
Introduction to the phenomena associated with the resistance of materials to damage under severe environmental conditions. Oxidation, corrosion, stress corrosion, corrosion fatigue and radiation damage are examined from the point of view of mechanism and influence on the properties of materials. Methods of corrosion protection and criteria for selection of materials for use in radiation related environments.
Credit Only Granted for: ENMA664 or ENMA698K.
Formerly: ENMA698K.

ENMA669 Special Topics in the Chemical Physics of Materials (3 Credits)
Restriction: Permission of ENGR-Materials Science & Engineering department; and permission of instructor.

ENMA671 Defects in Materials (3 Credits)
Fundamental aspects of point (electronic and atomic) defects, dislocations, and surfaces and interfaces in materials. Defect interactions, defect models, and effects of zero, one and two dimensional defects on material behavior.
Restriction: Permission of ENGR-Materials Science & Engineering department.

ENMA674 Advanced Computational Materials Science (3 Credits)
An introduction for beginning graduate students to study atomistic modeling and simulation techniques that are used in materials science. Theories and applications of atomistic scale modeling techniques to simulate, understand, and predict the properties of materials will be covered. Topics include: molecular statics, quantum mechanical methods, molecular dynamics simulations and Monte Carlo simulations.
Restriction: Permission of ENGR-Materials Science & Engineering department.
Credit Only Granted for: ENMA674 or ENMA 698A.
Formerly: ENMA698A.

ENMA679 Special Topics in the Mechanical Behavior of Materials (3 Credits)
Topics of current interest in the mechanical behavior of materials.
Restriction: Permission of ENGR-Materials Science & Engineering department.

ENMA680 Determination of Structure, Chemical Composition and Defects in Materials (3 Credits)
Basic principles of electron microscopy theory, electron diffraction, and imaging theory. The electron beam sample interaction that gives rise to different signals is related to the structural and compositional information that is obtained from a sample using a TEM. The most common TEM techniques for structural characterization of a sample, namely, electron diffraction, bright/dark field imaging, and high resolution lattice imaging are discussed. Compositional information obtained from x-ray fluorescence and electron energy loss as well as the resolution of these techniques is also covered. A description of techniques used to study magnetic materials is also presented.
Prerequisite: ENMA650.
Restriction: Permission of ENGR-Materials Science & Engineering department.

ENMA681 Diffraction Techniques in Materials Science (3 Credits)
Advanced methods of x-ray scattering/diffraction available thanks to the more powerful sources available to us. The availability of these sources enables us to study liquid crystals, polymers, nanomaterials, quasiorganized materials (including nano) and disordered materials. We will consider scattering/diffraction from the electronic level and build up to the molecular level.
Prerequisite: Permission of ENGR-Materials Science & Engineering department.

ENMA682 Electron Microscopy for Research (3 Credits)
An overview of the basic principles of operation for modern electron microscopes and how they are used in modern research. Details will be given on the construction of microscopes, their basic operation, and the types of questions that can be addressed with an electron microscope. Emphasis will be placed on a conceptual understanding of the underlying theories, and how to apply these to real-world research problems. Independent study into a specific area of electron microscopy will contribute to a term paper. Upon completion of this course, student will be expected to have a basic understanding sufficient to give interpretations of microscopy images and to suggest the correct tool or approach for certain research studies.
Restriction: Permission of ENGR-Materials Science & Engineering department.
Credit Only Granted for: ENMA682 or ENMA698J.
Formerly: ENMA698J.

ENMA683 Structural Determination Laboratory (1 Credit)
The operation of an electron microscope is covered. TEM techniques that are used to characterize the structure, defects and composition of a sample are presented and used to study a variety of materials. These techniques are: electron diffraction patterns, bright/dark field imaging, high resolution lattic imaging and energy dispersive x-ray spectroscopy. Also covers different sample preparation techniques for TEM. The goal is that the students become independent users of the TEM.
Restriction: Permission of ENGR-Materials Science & Engineering department.
Credit Only Granted for: ENMA698L or ENMA683.
Formerly: ENMA698L.

ENMA685 Advanced Electrical and Optical Materials (3 Credits)
Students become familiar with basic and state of the art knowledge of some technologically relevent topics in materials engineering and applied physics, including dielectric/ferroelectric materials, magnetic materials, superconductors, multiferroic materials and optical materials with an underlying emphasis on the thin film and device fabrication technology. Fundamental physical properties and descriptions of different materials and their applications are included. Discussion will include new developments in the fields.
Credit Only Granted for: ENMA685 or ENMA698F.
Formerly: ENMA698F.

ENMA687 Nanoscale Photonics and Applications (3 Credits)
Advanced topics in photonics including optical ray propogation, LEDS and the interaction of light in nanostructured materials for optoelectronic applications will be covered.
Credit Only Granted for: ENMA687 or ENMA698Z.
Formerly: ENMA698Z.

ENMA688 Seminar in Materials Science and Engineering (1 Credit)
Current research in materials science and engineering and related fields.
Restriction: Must be in Engineering: Materials Science program.
Repeatable to: 4 credits if content differs.
Formerly: ENMA697.

ENMA689 Special Topics in Engineering Materials (3 Credits)
Restriction: Permission of instructor; and permission of ENGR-Materials Science & Engineering department.
Repeatable to: 6 credits if content differs.
Formerly: ENMA691.

ENMA698 Special Problems in Materials Science and Engineering (1-3 Credits)
Individual, supervised study in materials science and engineering.
Restriction: Permission of ENGR-Materials Science & Engineering department.
Repeatable to: 6 credits if content differs.

ENMA797 Independent Study (3 Credits)
This course is designed to provide students with a directed independent study course in order to prepare the scholarly paper required for the master's degree without thesis degree option.

ENMA799 Master's Thesis Research (1-6 Credits)

ENMA808 Advanced Topics in Engineering Materials (3 Credits)
Restriction: Permission of ENGR-Materials Science & Engineering department.
Repeatable to: 6 credits if content differs.

ENMA898 Pre-Candidacy Research (1-8 Credits)

ENMA899 Doctoral Dissertation Research (1-8 Credits)

ENME - Engineering, Mechanical

ENME400 Machine Design (3 Credits)
Design of mechanical elements and planar machines. Failure theories. Design of pressure vessels, joints, rotating elements, and transmission elements. Kinematic structures, graphical, analytical, and numerical analysis and synthesis of linkages, gear trains, and flywheels are covered.
Prerequisite: Must have completed or be concurrently enrolled in ENME361.
Restriction: Permission of ENGR-Mechanical Engineering department.

ENME401 Entrepreneurial Design Realization (3 Credits)
The vision for this course, and an aspect that makes it unique, is to expose students to the opportunities and challenges of bringing a product design to reality (entrepreneurship). The emphasis is on environmentally and socially sustainable projects. The end-product of this course will be full-scale implementations or complete design "packages" that can be taken to potential stakeholders.
Cross-listed with: ENES401.
Restriction: Must have senior standing and permission of instructor.
Credit Only Granted for: ENME401, ENME489B or ENES401.
Formerly: ENME489B.

ENME406 Roller Coaster Engineering (3 Credits)
Engineering of roller coasters including: specifications, concept creation, structural design, car design, and safety. Course covers biomechanics and rider kinematics as well as manufacturing aspects.
Prerequisite: ENES220, ENES221, and ENME272. And ENME202; or MATH206.
Corequisite: ENME400.
Restriction: Permission of ENGR-Mechanical Engineering department.

ENME407 Sustainability, Climate Change and Renewable Energy Systems (3 Credits)
Countries around the world are developing innovative and sustainable solutions that not only help to protect the environment from the threats of global climate change, but that also can improve human health and quality of life. In this course students will explore solutions to climate change, as well as geothermal and hydroelectric energy systems and their applications.
Prerequisite: PHYS260; or permission of ENGR-Mechanical Engineering department.
Restriction: Students must have completed a minimum of 60 credits by the time they will enroll in this course.

ENME408 Selected Topics in Engineering Design (3 Credits)
Creativity and innovation in design. Generalized performance analysis, reliability and optimization as applied to the design of components and engineering systems. Use of computers in design of multivariable systems.
Restriction: Must be in Engineering: Mechanical program; and senior standing. Or permission of ENGR-Mechanical Engineering department.
Repeatable to: 6 credits if content differs.

ENME410 Design Optimization (3 Credits)
Introduction to the formal process of design optimization, including analytical and computational methods. Step by step design optimization techniques. Design optimization concepts, necessary and sufficient optimality conditions and solution techniques. Solution evaluation and tradeoff exploration.
Prerequisite: ENME271; or MATH206.
Restriction: Permission of ENGR-Mechanical Engineering department; and junior or senior standing.

ENME413 Bio-Inspired Robotics (3 Credits)
Fundamentals and applications of biologically inspired robots, traditional robots, and design and fabrication of biologically inspired robots.
Prerequisite: Must have completed or be concurrently enrolled in ENME351.
Restriction: Permission of ENGR-Mechanical Engineering department.
Credit Only Granted for: ENME413 or ENME489L.
Formerly: ENME489L.

ENME416 Additive Manufacturing (3 Credits)
Develop a comprehensive understanding of fundamental additive manufacturing, 3D printing approaches, including: extrusion-based deposition, stereolithography, powder bed-based melting, and inkjet-based deposition. Cultivate a design for-additive manufacturing skillset for CAD and CAM methodologies to produce successful 3D prints. Fabricate 3D mechanical objects using a variety of 3D printing technologies on campus. Execute a design project that demonstrates how additive manufacturing technologies can overcome critical limitations of traditional manufacturing processes.
Prerequisite: ENME331. And ENME272; or ENME414.
Restriction: Permission of ENGR-Mechanical Engineering department.

ENME417 Numerical Methods in Engineering (3 Credits)
Covers the fundamental aspects of how to apply analytical mathematical concepts to discrete data. The course is aimed at graduate students and senior undergraduate students in any area of engineering, and treats the material in a general manner that is not specific to any application or field of specialization.
Recommended: Senior standing.
Jointly offered with: ENME745.
Restriction: Permission of ENGR-Mechanical Engineering department.
Credit Only Granted for: ENME745, ENME808B, ENME417 or ENME489J.
Formerly: ENME489J.

ENME420 Energy Audit for Decarbonization and Sustainability Enhancement (3 Credits)
Provides students with fundamentals and applications of de-carbonization of building systems for energy sustainability through energy audit and efficiency measures, renewable energy, and electrification. Topics covered include societal and economic motivations for de-carbonization of buildings; building energy auditing and energy consumption analysis; lighting systems and controls; heating/cooling and ventilation systems; integrated building automation systems; fundamentals of renewable energy for building applications; fundamentals of building electrification and energy storage devices; emerging technologies for building energy sustainability.
Prerequisite: ENES232 .
Corequisite: ENME332.
Restriction: Permission of the department.
Credit Only Granted for: ENME420 or ENME489I.
Formerly: ENME489I.

ENME421 Engineering Design Ideation (3 Credits)
Engineering Design Methods is a technical elective for engineering students who wish to improve their ability to produce design ideas (i.e., the ideation process) for further development into conceptual ideas. Ideation is the creative, idea generation activity that happens at the beginning of the conceptual design process. Ideation methods are often built around creativity improving strategies and are often designed for individual use prior to presenting the results in a team setting.
Prerequisite: Must have completed or be concurrently enrolled in ENME371.
Restriction: Junior standing or higher.
Additional Information: Ideally, this course should be taken prior to capstone design.

ENME422 Indoor Environment and Mechanical Systems (3 Credits)
Fundamentals of indoor air quality and its measurements. Exploration of air cleaning technologies for gaseous, particulate and infectious agent contaminants. Simulations of air flow and contaminants with multi-zone models to allow testing of both contaminant dispersion in buildings and effectiveness of air cleaning technologies.
Prerequisite: ENES232 and ENME332.
Jointly offered with: ENME753.
Credit Only Granted for: ENME422 or ENME753.

ENME423 Modern Climate Control and Building Energy Design/Analysis (3 Credits)
Fundamentals and design calculations of heat and moisture transfer in buildings; evaluation of cooling, heating and power requirements of buildings; building energy consumption simulations, use of alternative energy and energy conservation measures in buildings; fundamentals of fans/pumps and air/water distribution in buildings; introduction to refrigeration and energy systems for data centers and other mission-critical facilities.
Prerequisite: ENES232.
Corequisite: ENME332.
Restriction: Permission of ENGR-Mechanical Engineering department.

ENME424 Urban Microclimate and Energy (3 Credits)
Urban microclimate from the perspective of transient heat and mass transfer using building energy simulations for building clusters as well as LEED building certification criteria. The focus is on understanding building energy consumption and environmental impacts from the individual building scale to a neighborhood scale.
Prerequisite: ENES232; and must have completed or be concurrently enrolled in ENME332 .
Jointly offered with: ENME742.
Restriction: Permission of ENGR-Mechanical Engineering department.
Credit Only Granted for: ENME424 or ENME742.

ENME425 Energy Conversion Systems for Sustianability (3 Credits)
Focus on energy sustainability with view on changing global energy availability and use. Addresses the objective of greatly reducing our dependence on the finite amounts of fossil energy sources available for our quest to achieve environmentally benign sustainable energy for green environment. The emphasis will be on sustainability issues, discussion on supply, demand and storage, energy transmission, global warming and carbon management, biomass-resources, uses and production of biofuels, national energy policy discussion, carbon emission, energy security and economics to ensure future energy needs can be met without compromising the ability of future generation to meet their own needs with due considerations to increase in global temperatures.
Prerequisite: ENES232.
Restriction: Permission of the Mechanical Engineering Department.
Credit Only Granted for: ENME489X or ENME425.
Formerly: ENME489X.

ENME426 Production Management (3 Credits)
The basic concepts and models needed to understand and design manufacturing systems, including the history of manufacturing, performance measures, queuing systems, variability, production planning and scheduling, lean manufacturing, and pull production control.
Credit Only Granted for: BMGT385 or ENME426.

ENME427 CSI Mechanical: Finding Reasons for Compromised Structural Integity (3 Credits)
Understanding the causes of product failures including the political, societal, economic, environmental, and ethical impact of these failures, and the strategies to avoid, postpone, or mitigate them. Students will be encouraged to combine concepts from engineering, natural sciences, social sciences, and the humanities to address these complex issues. Basics of failure analysis, forensics, and reliability engineering and the scientific fundamentals underlying the most common types of failure. Issues of legal liability. Methods for monitoring the existing condition of a structure.
Prerequisite: ENES220 and ENME382.
Restriction: Permission of ENGR-Mechanical Engineering department.

ENME430 Fundamentals of Nuclear Reactor Engineering (3 Credits)
Fundamental aspects of nuclear physics and nuclear engineering, including nuclear interactions; various types of radiation and their effects on materials and humans; and basic reactor physics topics, including simplified theory of reactor critically.
Prerequisite: MATH246.
Restriction: Permission of ENGR-Mechanical Engineering department.

ENME431 Nuclear Reactor Systems and Safety (3 Credits)
Engineering, material and thermal aspects of light water reactors, fast reactors, high temperature gas reactors, heavy water moderated reactors, breeder reactors, advanced reactors including GEN IV designs. Evolution of light water reactor safety and regulation in the US that has culminated in the current body of regulations.
Prerequisite: MATH246.
Recommended: ENME430.
Restriction: Permission of ENGR-Mechanical Engineering department.

ENME432 Reactor and Radiation Measurements Laboratory (3 Credits)
Basics concepts of nuclear radiation and radiation detectors including types of radiation, radioactive decay, and interactions of radiation with matter.
Prerequisite: ENME430 and MATH246.
Restriction: Permission of ENGR-Mechanical Engineering department.

ENME433 Nuclear Reactor Design (3 Credits)
Principles of nuclear reactor engineering including nuclear reactor system design, materials, thermal-hydraulics, shielding, mechanical design, and safety analysis.
Restriction: Permission of ENGR-Mechanical Engineering department.
Credit Only Granted for: ENME433 or ENME489T.
Formerly: ENME489T.

ENME434 Engineering Quantum Systems and Sensors (3 Credits)
Designed for students interested in learning quantum mechanics from a technological perspective, illustrated through specific examples from quantum engineering at the nanoscale and from discrete quantum systems. The focus is not on textbook examples such as hydrogen atom solutions and angular momentum algebra. Instead, focus areas would be quantum sensors and systems, description and control of quantum noise, which should elicit particular appeal across many areas of engineering and physical sciences. The course will prepare students for emerging quantum technologies besides computing and cryptography that are part of the Quantum 2.0 revolution.
Prerequisite: PHYS270 and MATH141.
Recommended: Any MATH 240, MATH 461, MATH341, or ENEE290 or equivalent courses covering linear algebra, eigenvalues, and eigenvectors.
Jointly offered with: ENME692.
Restriction: Permission of Mechanical Engineering department.
Credit Only Granted for: ENME434 or ENME692.

ENME435 Remote Sensing Instrumentation (3 Credits)
Explores the fundamentals of remote sensing techniques including light detection and ranging (lidar), radar, and computer vision in the context of emerging technologies such as autonomous navigation, terrain modeling, and embedded smart devices.
Prerequisite: ENME351.
Restriction: Permission of ENGR-Mechanical Engineering department.
Credit Only Granted for: ENME435 or ENME489Y.
Formerly: ENME489Y.

ENME436 Renewable Energy (3 Credits)
Fundamentals, design/analysis tools, and state of the art renewable energy technologies. Energy resources and global perspectives of current and future energy demand/consumption trends, followed by prime renewable energy technologies, including wind, solar, hydro, geothermal, and ocean thermal energy conversion. Economics of renewable energy, energy conservation opportunities, CO2 capture and storage, and thermal energy storage.
Prerequisite: ENME331.
Restriction: Must be in a major within the ENGR-Mechanical Engineering department.
Credit Only Granted for: ENME489K or ENME436.
Formerly: ENME489K.

ENME437 Data Science in Manufacturing Quality Control (3 Credits)
Introduces manufacturing quality management in the big data era. Students will learn quality improvement philosophies, statistical modeling of process quality (statistical process control and control charts), and measurement system analysis (gauge repeatability and reproducibility). Students will also explore the application of machine learning towards quality prediction and classification of manufactured products, and understand the limitations of applied supervised and unsupervised machine learning in the realm of manufacturing quality control.
Prerequisite: A minimum grade of C- in ENME202 and ENME392.
Jointly offered with: ENME697.
Restriction: Permission of ENGR-Mechanical Engineering department .
Credit Only Granted for: ENME437 or ENME697.

ENME440 Applied Machine Learning for Engineering and Design (3 Credits)
Learn how to apply techniques from Artificial Intelligence and Machine Learning to solve engineering problems and design new products or systems. Design and build a personal or research project that demonstrates how computational learning algorithms can solve difficult tasks in areas you are interested in. Master how to interpret and transfer state-of-the-art techniques from computer science to practical engineering situations and make smart implementation decisions.
Prerequisite: ENME392; or permission of instructor.
Jointly offered with: ENME743.
Restriction: Permission of ENGR-Mechanical Engineering department.
Credit Only Granted for: ENME440 or ENME743.

ENME441 Mechatronics and the Internet of Things (3 Credits)
Mechatronics and the Internet of Things combines sensors, actuators, computation, and communication to realize integrated objects capable of robust Internet-based interfacing. Students will gain experience with circuit development, mechatronic systems, MicroPython coding, and Internet communication protocols using the ESP32 microcontroller platform. The project-focused course combines lectures and hands-on labs to drive learning at the convergence of mechanics, electronics, and software domains for IoT smart object development.
Prerequisite: ENME351.
Restriction: Permission of ENGR-Mechanical Engineering department.
Credit Only Granted for: ENME489B or ENME441.
Formerly: ENME489B.

ENME442 Information Security (3 Credits)
The materials presented are divided into three major components: overview, detailed concepts and implementation techniques. The topics to be covered are: general security concerns and concepts from both a technical and management point of view, principles of security, architectures, access control and multi-level security, trojan horses, covert channels, trap doors, hardware security mechanism, security models, security kernels, formal specifications and verification, networks and distribution systems and risk analysis.
Restriction: Must have Senior standing in engineering; and permission of ENGR-Mechanical Engineering department. Jointly offered with ENRE684 .
Credit Only Granted for: ENRE648J, ENME442, ENRE684, or ENPM808E.

ENME444 Assistive Robotics (3 Credits)
Fundamentals of assistive robots used in a wide varietyof ways to help humans with disabilities. Three application areas will be covered: (1) Rehabilitation robotics to recover motor function from neurologic injuries such as stroke, (2) Prosthetics to enable mobility function in amputees, and (3) Social robotics for cognitive impairment and developmental disorders such as autism. Theory behind different control systems employed by assistive robotics, as well as the mechanical design, sensors & actuators, and user interfaces behind representative robots in the respective areas. Guidelines for designing assistive robots. Ethical and regulatory considerations in the design of assistive robots.
Prerequisite: ENME351; and must have completed or be concurrently enrolled in ENME462.
Restriction: Permission of ENGR-Mechanical Engineering department.

ENME445 Design for Reliability (3 Credits)
Failure prevention, accident prevention, design requirements analysis, designing right the first time, high system reliability, software reliability, manufacturing defect prevention, life cycle costs reduction, design reviews, managing the design for reliability, design trustworthiness, product durability, and writing good specifications are covered.
Restriction: Junior standing or higher.

ENME446 Medical Robotics (3 Credits)
The fundamentals of robot design, control and different areas of research regarding development are explored. Student will engage in a course project where they will learn to develop, build, and control a medical robot. Surgical robotics development and modeling of robotic systems, safety in medical robotics, haptics, ergonomics and surgery. Fundamentals of robot design and control. Kinematics. This proposal was approved through the Testudo Curriculum Management system.
Prerequisite: Must have completed or be concurrently enrolled in ENME361.
Restriction: Permission of ENGR-Mechanical Engineering department.
Credit Only Granted for: ENME489C, ENME808M or ENME446.
Formerly: ENME489C.

ENME454 Vehicle Dynamics (3 Credits)
The fundamentals of passenger vehicle and light truck design and vehicle dynamics are covered. The engineering principles associated with acceleration, braking, handling, ride quality, aerodynamics, and tire mechanics are discussed, as well as suspension and steering design.
Corequisite: ENME361.
Restriction: Permission of ENGR-Mechanical Engineering department.

ENME461 Control Systems Laboratory (3 Credits)
Students will design, implement, and test controllers for a variety of systems. This will enhance their understanding of feedback control familiarize them with the characteristics and limitations of real control devices. Students will also complete a small project. This will entail writing a proposal, purchasing parts for their controller, building the system, testing it, and writing a final report describing what they have done.
Prerequisite: ENME351 and ENME361.
Restriction: Permission of ENGR-Mechanical Engineering department.
Credit Only Granted for: ENEE461 or ENME461.

ENME462 Vibrations, Controls, and Optimization II (3 Credits)
Continuation of ENME361. Fundamentals of vibration, controls, and optimization. Analysis and design in time, Laplace and frequency domains. Mathematical descriptions of system response, system stability, control and optimization. Optimal design of mechanical systems.
Prerequisite: ENME361.
Restriction: Permission of the Mechanical Engineering Department.

ENME464 Cost Analysis for Engineers (3 Credits)
An introduction to the financial and cost analysis aspects of product engineering. Introduces key elements of traditional engineering economics including interest, present worth, depreciation, taxes, inflation, financial statement analysis, and return on investment. Provides an introduction to cost modeling as it applies to product manufacturing and support. Cost modeling topics will include: manufacturing cost analysis, life-cycle cost modeling (reliability and warranty), and cost of ownership.
Prerequisite: ENME392; or students who have taken courses with comparable content may contact the department.
Restriction: Permission of ENGR-Mechanical Engineering department.

ENME465 Probability-Based Design (3 Credits)
Review of probabilistic distributions, introduction to pseudo-random number generation, and algorithms to produce probability distributions using Monte Carlo simulation via Matlab and other approaches to best design probabilistic engineering problems.
Prerequisite: MATH206 and ENME392.
Restriction: Permission of ENGR-Mechanical Engineering department.

ENME466 Lean Six Sigma (3 Credits)
This course intends to provide in-depth understanding of Lean Six Sigma and its Define - Mearsure - Analyze - Improve - Control (DMAIC) Breakthrough Improvement Strategy. The emphasis is placed on the DMAIC process which is reinforced via application of semester long corporate projects and case study analysis.
Corequisite: ENME392; or students who have taken courses with comparable content may contact the department.
Restriction: Permission of ENGR-Mechanical Engineering department.

ENME467 Engineering for Social Change (3 Credits)
Critical analysis of issues at the intersection of engineering, philanthropy and social change. How engineering design, products and processes have created social change in the past and will do so in the future through both intended and unintended consequences. Topics covered include energy, sustainability and climate change, autonomy, the digital future, low cost engineering, manufacturing, philanthropy, ethics and the impact of electronics on society, among others. Faculty and external experts will engage with students on these topics. Students will broadly engage with organizations involved in using technology for positive social impact.
Cross-listed with: ENES467.
Restriction: Junior standing or higher.
Credit Only Granted for: ENES467 or ENME467.
Additional Information: Students in the Mechanical Engineering (ENME) major should register for ENME467, all other majors should register under ENES467.

ENME470 Finite Element Analysis (3 Credits)
Basic concepts of the theory of the finite element method. Applications in solid mechanics and heat transfer.
Restriction: Senior standing; and permission of ENGR-Mechanical Engineering department.

ENME472 Integrated Product and Process Development (3 Credits)
Integration of product development with the development process. Design strategies. Product architecture. Design for manufacturing. Selection of materials. Design for assembly.
Prerequisite: ENME331, ENME361, ENME351, and ENME371; and must have completed or be concurrently enrolled in ENME332.
Restriction: Permission of the Department of Mechanical Engineering.

ENME473 Mechanical Fundamentals of Electronic Systems (3 Credits)
An understanding of the fundamental mechanical principles used in design of electronic devices and their integration into electronic systems will be provided. Focus will be placed on the effect of materials compatibility, thermal stress, mechanical stress, and environmental exposure on product performance, durability and cost. Both electronic devices and package assemblies will be considered. Analysis of package assemblies to understand thermal and mechanical stress effects will be emphasized through student projects.
Prerequisite: ENME351.
Jointly offered with: ENME690.
Restriction: Permission of the Department of Mechanical Engineering.
Credit Only Granted for: ENME473 or ENME690.

ENME476 Mircoelectromechanical Systems (MEMS) I (3 Credits)
Fundamentals of microelectromechanical systems (MEMS). Introduction to transducers and markets. MEMS fabrication processes and materials, including bulk micromachining, wet etching, dry etching, surface micromachining, sacrificial layers, film deposition, bonding, and non-traditional micromachining. Introduction to the relevant solid state physics, including crystal lattices, band structure, semiconductors, and doping. The laboratory covers safety, photolithography, profilometry, wet etching.
Restriction: Senior standing.
Credit Only Granted for: ENME476 or ENME489F.
Formerly: ENME489F.

ENME477 Microelectromechanical Systems (MEMS) II (3 Credits)
Fabrication of devices designed in MEMS I, including everything from mask printing through training on state-of-the-art fabrication equipment through device testing. In-depth understanding of MEMS devices and technologies, such as mechanical and electromagnetic transducers, microfluidics, and chemical sensors.
Prerequisite: ENME476.

ENME479 Selected Topics in Mechanical Engineering (1-3 Credits)
Covers current topics in mechanical engineering and related fields.
Restriction: Permission of the Department of Mechanical Engineering.
Repeatable to: 6 credits if content differs.

ENME480 Introduction to Robotics (3 Credits)
An introductory course in robotics that will educate students in the elementary concepts of robotics. The course will encompass both theory and experiments.
Prerequisite: MATH246 or ENES221; and (CMSC131, ENME202, ENAE202 or ENEE150).
Restriction: Must be in the Robotics and Autonomous Systems minor; or Permission of ENGR-Mechanical Engineering department.
Credit Only Granted for: ENME480 or ENMT380.

ENME483 Physics of Turbulent Flow (3 Credits)
Specific problems of turbulent flow including automobile and truck aerodynamics and canonical flows including pipes, jets and boundary layers that are measured and simulated to gain basic understanding of turbulence. A goal of the course is to impart the necessary background for students to be able to critically assess and most effectively employ the turbulent flow prediction codes (e.g. Fluent) that are a mainstay of how turbulence is analyzed in modern industries.
Prerequisite: ENME331.
Restriction: Permission of ENGR-Mechanical Engineering department. Jointly offered with ENME656. Credit only gran ted for: ENME483 or ENME656.

ENME484 Analysis of Turbulent Flow (3 Credits)
Relentless growth in the speed and size of supercomputers has encouraged the ever expanding use of numerical simulation in the practice of fluids engineering. For the flow past ground vehicles, in the urban grid, re-entering rockets, helicopters landing on ships at sea and countless other examples, the flow is turbulent, and simulation is becoming or will one day become the methodology of choice in analyzing and designing such technologies. The goal of this course is to give an introduction to the analysis of turbulent flow via simulation and the modeling that is used in its development. Among the questions to be considered: What can one hope to learn from flow simulation? What are the strengths of the approach and what obstacles inhibit its application? What kind of physical considerations are required in setting up simulations? How does one analyze the results of a simulation?
Prerequisite: ENME331.
Jointly offered with: ENME657.
Restriction: Permission of ENGR-Mechanical Engineering department.
Credit Only Granted for: ENME484 or ENME657.

ENME485 Industrial Artificial Intelligence (3 Credits)
Introduces students to advanced technologies such as machine learning and tools, prognostics and health management (PHM), and data-centric engineering analytics - that ultimately enable the conversion of industrial big data into decision-ready information that can be used to improve the design, the productivity and the efficiency of industrial systems.,
Prerequisite: ENME202 or equivalent, experience using Python, or permission of the instructor.
Jointly offered with: ENME691.
Restriction: Permission of ENGR-Mechanical Engineering Department.
Credit Only Granted for: ENME485 or ENME691.

ENME486 Computational Modeling, Simulation, and Interactive Visualization (3 Credits)
Creation of interactive graphic displays from the numerical simulation of mechanical engineering models. Brief description of each model provided, along with varied parameters to explore models' characteristics. Conclusions drawn from use of each interactive graphic. Mathematica language introduced and interwoven with the numerical simulation of the models, which will include: robotics and mechanisms, static response of beams, control systems, measurement systems, fluid flow, vibrations, geometric modeling, finite element analysis, and nonlinear phenomena.
Restriction: Senior standing; and permission of ENGR-Mechanical Engineering department.

ENME488 Special Problems (3 Credits)
Advanced problems in mechanical engineering with special emphasis on mathematical and experimental methods.
Restriction: Permission of ENGR-Mechanical Engineering department.
Repeatable to: 6 credits if content differs.

ENME489 Special Topics in Mechanical Engineering (3 Credits)
Selected topics of current importance in mechanical engineering.
Restriction: Permission of ENGR-Mechanical Engineering department.
Repeatable to: 6 credits.

ENME600 Engineering Design Methods (3 Credits)
An introductory graduate level course in critical thinking about formal methods for design in Mechanical Engineering. Course participants gain background on these methods and the creative potential each offers to designers. Participants will formulate, present, and discuss their own opinions on the value and appropriate use of design materials for mechanical engineering.

ENME605 Advanced Systems Control (3 Credits)
Modern control theory for both continuous and discrete systems. State space representation is reviewed and the concepts of controllability and observability are discussed. Design methods of deterministic observers are presented and optimal control theory is formulated. Control techniques for modifying system characteristics are discussed.
Prerequisite: ENME462; or permission of instructor.

ENME607 Engineering Decision Making and Risk Management (3 Credits)
Individual decision-making, group decisionmaking, and organizations of decision-makers in the context of engineering design, project management, and other functions. Techniques for making better decisions, for understanding how decisions are related to each other, and for managing risk.Cross-listed with ENRE671.
Credit Only Granted for: ENME808X, ENRE671 or ENME607.
Formerly: ENME 808X.

ENME610 Engineering Optimization (3 Credits)
Overview of applied single- and multi- objective optimization and decision making concepts and techniques with applications in engineering design and/or manufacturing problems. Topics include formulation examples, concepts, optimality conditions, unconstrained/constrained methods, and post-optimality sensitivity analysis. Students are expected to work on a semester-long real-world multi-objective engineering project.

ENME625 Multidisciplinary Optimization (3 Credits)
Overview of single- and multi-level design optimization concepts and techniques with emphasis on multidisciplinary engineering design problems. Topics include single and multilevel optimality conditions, hierarchic and nonhierarchic modes and multilevel post optimality sensitivity analysis. Students are expected to work on a semester-long project.

ENME631 Advanced Conduction and Radiation Heat Transfer (3 Credits)
Theory of conduction and radiation. Diffused and directional, poly- and mono-chromatic sources. Quantitative optics. Radiation in enclosures. Participating media. Integrodifferential equations. Multidimensional, transient and steady-state conduction. Phase change. Coordinate system transformations.
Prerequisite: ENME332; or students who have taken courses with comparable content may contact the department; or permission of instructor.

ENME632 Advanced Convection Heat Transfer (3 Credits)
Statement of conservation of mass, momentum and energy. Laminar and turbulent heat transfer in ducts, separated flows, and natural convection. Heat and mass transfer in laminar boundary layers. Nucleate boiling, film boiling, Leidenfrost transition and critical heat flux. Interfacial phase change processes; evaporation, condensation, industrial applications such as cooling towers, condensers. Heat exchangers design.
Credit Only Granted for: ENNU615 or ENME632.

ENME633 Molecular Thermodynamics (3 Credits)
An examination of the interactions between molecules, which govern thermodynamics relevant to engineering, will be conducted. We will investigate both classical and statistical approaches to thermodynamics for understanding topics such as phase change, wetting of surfaces, chemical reactions, adsorption, and electrochemical processes. Statistical approaches and molecular simulation tools will be studied to understand how molecular analysis can be translated to macroscopic phenomena.

ENME635 Energy Systems Analysis for Sustainability and Decarbonization (3 Credits)
Methods for the analysis of conventional and novel energy systems are taught throughout the course. Additional topics are, using the US National Energy Flow Chart to understand sources of carbon emissions, discussion of energy efficiency improvement methods, discussion of decarbonization and carbon capture and sequestration approaches and their impact on efficiency and emissions.
Prerequisite: Undergraduate thermodynamics course or permission of the instructor.
Credit Only Granted for: ENPM635 or ENME635.

ENME640 Fundamentals of Fluid Mechanics (3 Credits)
Equations governing the conservation of mass, momentum, vorticity and energy in fluid flows. Low Reynolds number flows. Boundary layers. The equations are illustrated by analyzing a number of simple flows. Emphasis is placed on physical understanding to facilitate the study of advanced topics in fluid mechanics.
Prerequisite: Must have completed partial differential equations at the level of MATH 462; or permission of ENGR-Mechanical Engineering department.
Formerly: ENME651.

ENME641 Viscous Flow (3 Credits)
Fluid flows where viscous effects play a significant role. Examples of steady and unsteady flows with exact solutions to the Navier-Stokes equations. Boundary layer theory. Stability of laminar flows and their transition to turbulence.
Prerequisite: ENME640; or students who have taken courses with comparable content may contact the department; or permission of instructor.
Formerly: ENME652.

ENME642 Hydrodynamics I (3 Credits)
Exposition of classical and current methods used in analysis of inviscid, incompressible flows.
Prerequisite: ENME640; or students who have taken courses with comparable content may contact the department; or permission of instructor.
Formerly: ENME653.

ENME645 Fluid-Structure Interactions (3 Credits)
Fundamentals of fluid-structure interactions, fluid-elastic instabilities (buckling, flutter, galloping) and their engineering applications. Possible domains of applications are civil engineering, aerospace engineering, ocean engineering, biomechanics, and soft robotics. Examples include tall bridges, aircraft wing, parachutes, solid rocket motor, turbomachinery, offshore platform, subsea pipelines, paper printing, MEMS mircochannels, blood flow in arteries, and heart valves. The fish swimming mechanics with be studied to inspire novel efficient propulsion mechanisms for soft robotics applications.
Prerequisite: ENME331 and ENME361.
Restriction: Must be a student in the Clark School of Engineering.
Credit Only Granted for: ENME498U, ENME645 or ENME809C.
Formerly: ENME809C.

ENME646 Computational Fluid Dynamics (3 Credits)
Fundamentals of numerical analysis of engineers. Inversion of large, sparse matrices. Numerical solution of the incompressible Navier-Stokes equations in Cartesian and curvilinear grids. Application to turbulent flows and micro-fluidics.
Prerequisite: Must have completed graduate-level fluid mechanics; or permission of instructor.

ENME647 Multiphase Flow and Heat Transfer (3 Credits)
Boiling and condensation in stationary systems, phase change heat transfer phenomenology, analysis and correlations. Fundamentals of two-phase flow natural circulation in thermal hydraulic multi-loop systems with applications to nuclear reactors safety. Multiphase flow fundamentals. Critical flow rates. Convective boiling and condensation. Multiphase flow and heat transfer applications in power and process industries.

ENME656 Theory and Modeling of Wall-Bounded Turbulent Flows (3 Credits)
Provides an introduction to turbulence with a specific focus on turbulent flows near solid boundaries in both external and internal flows. The course will cover both incompressible and compressible flows, and will introduce both theory and modeling approaches. The course will also include a more applied component where students will use Computational Fluid Dynamics software to analyze some representative flows
Prerequisite: ENME 331 or equivalent; or permission of instructor.

ENME662 Linear Vibrations (3 Credits)
Development of equations governing small oscillations and spatially continuous systems. Newton's equations, Hamilton's principle, and Lagrange's equations. Free and forced vibrations of mechanical systems. Modal analysis. Finite element discretization and reductions of continuous systems. Numerical methods. Random vibrations.

ENME664 Dynamics (3 Credits)
Kinematics in plane and space; Dynamics of particle, system of particles, and rigid bodies. Holonomic and non-holonomic constraints. Newton's equations, D'Alembert's principle, Hamilton's principle, and equations of Lagrange. Impact and collisions. Stability of equilibria.
Prerequisite: ENES221; or students who have taken courses with comparable content may contact the department; or permission of instructor.

ENME665 Nonlinear Oscillations (3 Credits)
Nonlinear oscillations and dynamics of mechanical and structural systems. Classical methods, geometrical, computational and analytical methods. Birfurcations of equillibrium and periodic solutions; chaos.
Prerequisite: ENME662 and ENME 700; or equivalent.

ENME670 Continuum Mechanics (3 Credits)
Mechanics of deformable bodies, finite deformation and strain measures, kinematics of continua and global and local balance laws. Thermodynamics of continua, first and second laws. Introduction to constitutive theory for elastic solids, viscous fluids and memory dependent materials. Examples of exact solutions for linear and hyper elastic solids and Stokesian fluids.

ENME672 Composite Materials (3 Credits)
Micromechanics of advanced composites with passive and active reinforcements, mathematical models and engineering implications, effective properties and damage mechanics, recent advances in "adaptive" or "smart" composites.

ENME674 Finite Element Methods (3 Credits)
Theory and application of finite element methods for mechanical engineering problems such as stress analysis. Basic development of the method for solving the types of governing partial differential equations that are the foundations for many engineering and physical sciences. The emphasis is on balancing the theoretical/mathematical background with a computable implementation to reach applications. Some code writing and debugging will be involved. This class is suited for graduate students or high-achieving undergraduates in engineering, mathematics, or the physical sciences. A very basic knowledge of matrix-vector calculations and multivariable calculus are required. Some exposure to partial differential equations and experience with Matlab or a compiled language will be helpful but are not required.
Restriction: Must be in one of the following programs (ENGR: MS/PhDMechanical Engineering (Master's); ENGR: MS/PhDMechanical Engineering (Doctoral); ENGR: MS/PhDReliability Engineering (Master's); ENGR: MS/PhDReliability Engineering (Doctoral); or permission of ENGR-Mechanical Engineering department.
Credit Only Granted for: ENME 674, ENAE652, ENPM652 or ENPM808F.

ENME675 A Mathematical Introduction to Robotics (3 Credits)
Designed to provide graduate students with some of the concepts in robotics from a mathematical viewpoint, including introduction to group theory and basics of SO(3) and SE(3) group applied to robotics; rigid body motion; manipulator kinematics; introduction to holonomic & non-holonomic constraints; dynamics of robot manipulators.
Credit Only Granted for: ENME675 or ENME808V.
Formerly: ENME808V.

ENME684 Modeling Material Behavior (3 Credits)
Constitutive equations for the response of solids to loads, heat, etc. based on the balance laws, frame invariance, and the application of thermodynamics to solids. Non-linear elasticity with heat conduction and dissipation. Linear and non-linear non-isothermal viscoelasticity with the elastic-viscoelastic correspondence principle. Classical plasticity and current viscoplasticity using internal state variables. Maxwell equal areas rule, phase change, and metastability and stability of equilibrium states. Boundary value problems. Introduction to current research areas.
Prerequisite: ENME670; or permission of instructor.

ENME690 Mechanical Fundamentals of Electronic Systems (3 Credits)
An understanding of the fundamental mechanical principles used in design of electronic devices and their integration into electronic systems will be provided. Focus will be placed on the effect of materials compatibility, thermal stress, mechanical stress, and environmental exposure on product performance, durability and cost. Both electronic devices and package assemblies will be considered. Analysis of package assemblies to understand thermal and mechanical stress effects will be emphasized through student projects.
Prerequisite: ENME351; or equivalent.
Jointly offered with: ENME473.
Credit Only Granted for: ENME473 or ENME690.

ENME691 Industrial Artificial Intelligence (3 Credits)
Introduces students to advanced technologies - such as machine learning and tools, prognostics and health management (PHM), and data-centric engineering analytics - that ultimately enable the conversion of industrial big data into decision-ready information that can be used to improve the design, the productivity and the efficiency of industrial systems.
Prerequisite: ENME202; or equivalent; experience using Python; or permission of the instructor.
Credit Only Granted for: ENME485 or ENME691.

ENME692 Engineering Quantum Systems and Sensors (3 Credits)
Designed for students interested in learning quantum mechanics from a technological perspective, illustrated through specific examples from quantum engineering at the nanoscale and from discrete quantum systems. The focus is not on textbook examples such as hydrogen atom solutions and angular momentum algebra. Instead, focus areas would be quantum sensors and systems, description and control of quantum noise, which should elicit particular appeal across many areas of engineering and physical sciences. The course will prepare students for emerging quantum technologies besides computing and cryptography that are part of the Quantum 2.0 revolution.
Prerequisite: PHYS270 and MATH141.
Recommended: Any MATH 240, MATH 461, MATH341, or ENEE290 or equivalent courses covering linear algebra, eigenvalues, and eigenvectors .
Jointly offered with: ENME434.
Credit Only Granted for: ENME434 or ENME692.

ENME694 Fundamentals of Optics and Optical Systems for Engineers (3 Credits)
This unique course is designed to teach the fundamentals of optics and optical systems for engineering students, more specifically (1) to familiarize students with the optical principles and applications, and (2) to help them learn the method details and develop skills for research and development. The key concepts are presented, with an emphasis on their physical meanings rather than theoretical and mathematical meanings, to help create a better understanding of optics for engineering applications.
Credit Only Granted for: ENME694 or ENME808Z.
Formerly: ENME808Z.

ENME695 Design for Reliability (3 Credits)
Reliability is the ability of a product or system to perform as intended (i.e., without failure and within specified performance limits) for a specified time, in its life-cycle conditions. Knowledge of reliability concepts and principles, as well as risk assessment, mitigation and management strategies prepares engineers to contribute effectively to product development and life cycle management. This course teaches the fundamental knowledge and skills in reliability as it pertains to the design, manufacture, and use of electrical, mechanical, and electro-mechanical products. Topics cover the suitability of the supply chain members to contribute towards development, manufacturing, distribution and support of reliable products; efficient and cost-effective design and manufacture of reliable products; process capability and process control; derating, uprating, FMMEA, reliability prediction and reliability allocation; how to plan and implement product testing to assess reliability; how to analyze degradation, failure, and return data to estimate fundamental reliability parameters; root cause analysis; and reliability issues associated with warranties, regulatory requirements, and liabilities.
Cross-listed with: ENRE695.
Credit Only Granted for: ENME695 or ENRE695.

ENME697 Advanced Data Science in Manufacturing Quality Control (3 Credits)
Introduces manufacturing quality management in the big data era. Students will learn quality improvement philosophies, statistical modeling of process quality (statistical process control and control charts), and measurement system analysis (gauge repeatability and reproducibility). Students will also explore the application of machine learning towards quality prediction and classification of manufactured products, and understand the limitations of applied supervised and unsupervised machine learning in the realm of manufacturing quality control.
Prerequisite: Minimum grade of C- in ENME202 and ENME392; or equivalent.
Jointly offered with: ENME437.
Credit Only Granted for: ENME437 or ENME697.

ENME700 Advanced Mechanical Engineering Analysis I (3 Credits)
An advanced, unified approach to the solution of mechanical engineering problems, emphasis is on the formulation and solution of equilibrium, eigenvalue and propagation problems. Review and extension of undergraduate material in applied mathematics with emphasis on problems in heat transfer, vibrations, fluid flow and stress analysis which may be formulated and solved by classical procedures.

ENME701 Sustainable Energy Conversion and the Environment (3 Credits)
Discussion of the major sources and end-uses of energy in our society with particular emphasis on renewable energy production and utilization. The course introduces a range of innovative technologies and discusses them in the context of the current energy infrastructure. Renewable sources such as wind and solar, and renewable enabling technologies such as energy storage are discussed in detail. Particular attention is paid to the environmental impact of the various forms of energy. This course is designed to provide, when taken together with ENME635, a comprehensive overview of sustainable energy production and utilization including carbon capture and sequestration.
Prerequisite: Undergraduate thermodynamics course or permission of instructor.

ENME704 Active Vibration Control (3 Credits)
This course aims at introducing the basic principles of the finite element method and applying it to plain beams and beams treated with piezoelectric actuators & sensors. The basic concepts of structural parameter i dentification are presented with emphasis on Eigensystem Realization Algorithms (ERA) and Auto-regression models (AR). Different active control algorithms are then applied to beams/piezo-actuator systems. Among thes e algorithms are: direct velocity feedback, impedancematchingcontrol, modal control methods & sliding mode controllers. Particular focus is given to feedforward Leat Mean Square (LMS) algorithm & filtered-X LMS. O ptimal placement strategies of sensor & actuators are then introduced & applied to beam/piezo-actuator systems.
Prerequisite: ENME662 and ENME602; or students who have taken courses with comparable content may contact the department.
Recommended: Completion of coursework or background in Vibrations and Control recommended.
Restriction: Must be in a major in ENGR-A. James Clark School of Engineering.

ENME707 Combustion and Reacting Flow (3 Credits)
This course covers thermochemistry and chemical kinetics of reacting flows in depth. In particular, we focus on the combustion of hydrocarbonf uels in both a phenomenological and mechanistic approach. The course co vers the specifics of premixed and nonpremixed flame systems, as wellasignition and extinction. Combustion modeling with equilibrium and chemical kinetic methods will be addressed. Environmental impact and emissi ons minimization will be covered in detail. Finally, the course will co ver available combustion diagnostic methods and their application in laboratory and real-world systems.
Prerequisite: ENME331 and ENME332; or students who have taken courses with comparable content may contact the department.

ENME711 Vibration Damping (3 Credits)
This course aims at introducing the different damping models that describe the behavior of viscoelastic materials. Emphasis will be placedon m odeling the dynamics of simple structures (beams, plates & shells) with Passive Constrained Layer Damping (PCLD). Considerations will also be g iven to other types of surface treatments such as Magnetic Constrained Layer Damping (MCLD), Shunted Network Constrained Layer Damping (SNCLD),Active Constrained Layer Damping (ACLD) and Electrorheological Constrained Layer Damping (ECLD). Energy dissipation characteristics of the damp ing treatments will be presented analytically & by using the modal strain energy approach as applied to finite element models of vibrating structures.
Prerequisite: ENME662; or students who have taken courses with comparable content may contact the department.
Recommended: Completion of coursework or background in Vibrations recommended.
Restriction: Must be in a major in ENGR-A. James Clark School of Engineering.

ENME712 Measurement, Instrumentation and Data Analysis for Thermo-Fluid Processes (3 Credits)
This course is designed to offer systemic coverage of the methodologies for measurement and data analysis of thermal and fluid processes at the graduate level. The course materials will cover three broad categories: (1) Fundamentals of thermal and fluid processes in single phase and multi phase flows as relates to this course; Measurement and Instrumentation techniques for measurement of basic quantities such as pressure, temperature, flow rate, heat flux, etc., and (3) Experimental Design and Planning, sources of errors in measurements, and uncertainty analysis.

ENME722 Equilibrium Modeling in Engineering (3 Credits)
Provide motivation and introduction to equilibrium models involving economics and engineering. We will concentrate on models involving markets (Nash-Cournot, etc.), those wherein the activities are spatially diverse, those involving energy activities or traffic flow, as well as selected other examples in mechanical engineering. Areas that will be covered include:Review of relevant optimization theory, presentation of the mixed complementarity problem (MCP) and variational inequality problem (VIP) formats to solve equilibrium problems as well as introduction to existence and uniqueness results, review of relevant game theory notions, presentation of specific models for engineering-economic applications, presentations for algorithms to solve these equilibrium problems.
Credit Only Granted for: ENCE722 or ENME722.

ENME725 Probabilistic Optimization (3 Credits)
Provide an introduction to optimization under uncertainty. Chance-constrained programming, reliability programming, value of information, two stage problems with recourse, decomposition methods, nonlinear and linear programming theory, probability theory. The objectives of this course are to provide understanding for studying problems that involve optimization under uncertainty, learn about various stochastic programming formulations (chance constrained programs, two stage methods with recourse, etc.) relevant to engineering and economic settings, present theory for solutions to such problems, and present algorithms to solve these problems.
Prerequisite: An advanced undergraduate course in probability and a graduate course in optimization or permission of the instructor required. Cross-listed with ENCE725.
Credit Only Granted for: ENME725 or ENCE725.

ENME737 Application of AI in Reliability: Prognostics and Systems Health Management (PHM) (3 Credits)
Prognostics and health management (PHM) is an enabling discipline consisting of technologies and methods to assess the reliability of a product in its actual life cycle conditions to determine the advent of failure and mitigate system risk. PHM permits the reliability of a system to be evaluated and predicted in its actual application conditions. In recent years, prognostics and health management (PHM) has emerged as a key enabling technology to provide an early warning of failure; to forecast maintenance as needed; to reduce maintenance cycles; to assess the potential for life extensions; and to improve future designs and qualification methods. In the future, PHM will enable systems to assess their own real-time performance (self-cognizant health management and diagnostics) under actual usage conditions and adaptively enhance life cycle sustainment with risk-mitigation actions that will virtually eliminate unplanned failures.
Credit Only Granted for: ENME737 or ENME808A.
Formerly: ENME808A.

ENME740 Lab-on-a-Chip Microsystems (3 Credits)
Fundamentals and application of lab-on-a-chip and microfluidic technologies. A broad view of the field of microfluidics, knowledge of relevant fabrication methods and analysis techniques, and an understanding of the coupled multi-domain phenomena that dominate the physics in these systems.
Credit Only Granted for: ENME 481, ENME 808E, ENME 740.
Formerly: ENME 808E.

ENME741 Operations Research Models in Engineering (3 Credits)
A survey of the fundamentals of operations research models and methods in engineering including: optimization using linear programming, nonlinear programming, integer programming, as well as equilibrium/ game theory via mixed complementarity problems. Examples of specialized course items include: specifics of optimizing power and gas networks, discussion of other network optimization problems, resource-constrained problems, two-level optimization as an example of mixed integer nonlinear programming (MINLP) programming problems as well as algorithms to solve the above types of problems."
Prerequisite: (ENCE302; or (ENME271 and ENME392)); and (MATH140 and MATH240).

ENME742 Urban Microclimate and Energy (3 Credits)
Examines urban microclimate from the perspective of transient heat and mass transfer using building energy simulations for building clusters. The focus is on understandingbuilding energy consumption and environmental impacts from the individual building scale (~100) to a neighborhood scale (~103). Emerging morphological properties of building clustersmodulate transient convective and radiative heat transfer resulting in different localmicroclimatic conditions. At the neighborhood scale, these conditions are analyzed using heatand mass transfer simulations in building clusters to provide boundary conditions for transient building energy simulations. At the individual building scale, besides the energy consumption,this course examines connection between indoor and outdoor environments.
Prerequisite: ENES232 or equivalent; and must have completed or be concurrently enrolled in ENEM332 or equivalent.
Jointly offered with: ENME424.
Credit Only Granted for: ENME424 or ENME742.

ENME743 Applied Machine Learning for Engineering and Design (3 Credits)
Learn how to apply techniques from Artificial Intelligence and Machine Learning to solve engineering problems and design new products or systems. Design and build a personal or research project that demonstrates how computational learning algorithms can solve difficult tasks in areas you are interested in. Master how to interpret and transfer state-of-the-art techniques from computer science to practical engineering situations and make smart implementation decisions.
Prerequisite: Must have completed undergraduate level Statistics (ENME392 or equivalent), or permission of the instructor.
Jointly offered with: ENME440.
Credit Only Granted for: ENME440 OR ENME743.

ENME744 Additive Manufacturing (3 Credits)
Develop a comprehensive understanding of fundamental additive manufacturing-alternatively, "three-dimensional (3D) printing-approaches, including extrusion-based deposition, stereolithography, powder bed-based melting, and inkjet-based deposition. Cultivate a "design-for-additive manufacturing" skill set for combining computer-aided design (CAD) and computer-aided manufacturing (CAM) methodologies to produce successful 3D prints. Fabricate 3D mechanical objects using a variety of 3D printing technologies on campus. Execute a design project that demonstrates how additive manufacturing technologies can overcome critical limitations of traditional manufacturing processes.
Prerequisite: ENME272 and ENME331; or students who have taken courses with comparable content may contact the department. Jointly offered wit h ENME416.
Credit Only Granted for: ENME 416 OR ENME 744.

ENME745 Numerical Methods in Engineering (3 Credits)
Fundamental aspects of how to apply analytical mathematical concepts to discrete data. The course is aimed at graduate students in any area of engineering, and treats the material in a general manner that is not specific to any application or field of specialization.
Jointly offered with: ENME417.
Credit Only Granted for: ENME745, ENME808B, ENME417 or ENME489J.
Formerly: ENME808B.

ENME750 Applied System Identification (3 Credits)
An introductory graduate level course on system identification, which concerns various methods and techniques for data-driven modeling and estimation of dynamical systems.
Credit Only Granted for: ENME808R or ENME750.
Formerly: ENME 808R.

ENME751 Applied Nonlinear Control (3 Credits)
An introductory graduate level course on nonlinear control design, which concerns various methods and techniques for the analysis and synthesis of nonlinear control systems.
Credit Only Granted for: ENME808B or ENME751.
Formerly: ENME808B.

ENME753 Indoor Environment and Mechanical Systems (3 Credits)
Fundamentals of indoor air quality and its measurements. Exploration of air cleaning technologies for gaseous, particulate and infectious agent contaminants. Simulations of air flow and contaminants with multi-zone models to allow testing of both contaminant dispersion in buildings and effectiveness of air cleaning technologies.
Jointly offered with: ENME422.
Credit Only Granted for: ENME422, ENME753, or ENME808U.
Formerly: ENME808U.

ENME765 Thermal Issues in Electronic Systems (3 Credits)
An overview of thermal management for micro/power electronics systems and helps engineers understand emerging thermal technologies. It will include the following topics: the background of electronics packaging, thermal design of heat sinks, single-phase and multiphase flow in thermal systems, two-phase heat exchange devices for portable and high-powered electronic systems, and computational fluid dynamics for the design of thermal systems.
Credit Only Granted for: ENME765 or ENME808D.
Formerly: ENME808D.
Additional Information: Students must have prior coursework similar to the content offered in undergraduate courses ENME331, ENME332, and ENME473.

ENME770 System Sustainment: The Science and Policy of Sustaining Critical Systems (3 Credits)
Introduces the important attributes of system sustainment (system maintenance, support and upgrade) by integrating data analytics, cost analysis and public policy. Topics include: acquisition, reliability, maintenance, availability, inventory management, supply chain, life-cycle cost and contracting.
Credit Only Granted for: PLCY798J or ENME770.

ENME775 Manufacturing Technologies for Electronic Systems (3 Credits)
This highly multi-disciplinary course presents the mechanical fundamentals of manufacturing processes used in electronics assemblies. The emphasis is on quantitative modeling of the intrinsic impact that processing has on structure, properties, performance and durability. Students will learn how to quantitatively model many of the key manufacturing steps from mechanistic first principles, so that sensitivity studies and process optimization can be performed in a precise manner. Processes considered include: wafer-level processes such as polishing, lithography, etching and dicing; packaging operations such as die attachment, wirebonding, flip chip bonding, and plastic encapsulation; multilevel high-density substrate fabrication processes; assembly processes such as reflow and wave soldering of surface-mount components to electronic substrates.
Prerequisite: ENME690.

ENME780 Mechanical Design of High Temperature and High Power Electronics (3 Credits)
This course will discuss issues related to silicon power device selection (IGBT, MCT, GTO, etc.), the characteristics of silicon device operation at temperatures greater thatn 125C, and the advantages of devices based on SOI and SiC. It will also discuss passive components and packaging materials selection for distributing and controlling power, focusing on the critical limitations to use of many passive components and packaging materials at elevated temperatures. In addition it will cover packaging techniques and analysis to minimize the temperature elevation caused by power dissipation. Finally, models for failure mechanisms in high temperature and high power electronics will be presented together with a discussion of design options to mitigate their occurrence.
Prerequisite: ENME382, ENME473, or ENME690.

ENME799 Master's Thesis Research (1-6 Credits)

ENME808 Advanced Topics in Mechanical Engineering (2-3 Credits)

ENME809 Special Topics in Mechanical Engineering (1-3 Credits)
Covers current topics in mechanical engineering and related fields.
Restriction: Permission of the Mechanical Engineering department.
Repeatable to: 6 credits if content differs.

ENME898 Pre-Candidacy Research (1-8 Credits)

ENME899 Doctoral Dissertation Research (1-8 Credits)

ENPM - Engineering, Professional Masters

ENPM604 Machine Learning Techniques Applied to Cybersecurity (3 Credits)
Focuses on applying machine learning techniques to cybersecurity, and includes labs to be done independently, as well as an overview of the latest machine learning algorithms and their application to cyber. A brief overview of which techniques should be applied to particular cyber problems will be provided, and the course culminates in students researching the latest applications of Machine learning to cyber, allowing the students to each develop a niche of expertise in that specific subtopic. As such, the students should be increasingly employable in their area of cyber expertise by industries searching for solutions to their cyber problem space.
Credit Only Granted for: ENPM808R or ENPM604.
Formerly: ENPM808R.

ENPM605 Python Applications for Robotics (3 Credits)
This hands-on course will look at the use of Python 3 with the Robot Operating System (ROS) in order to control a mobile robot in Gazebo simulated environments.
Credit Only Granted for: ENPM809E or ENPM605.
Formerly: ENPM809E.

ENPM611 Software Engineering (3 Credits)
Software engineering concepts, methods, and practices important to both the theorist and the practitioner will be covered. The entire range of responsibilities expected of a software engineer are presented. The fundamental areas of requirements development, software design, programming languages, and testing are covered extensively. Sessions on supporting areas such as systems engineering, project management, and software estimation are also included.
Prerequisite: Competency in one programming language is required, Python preferred.

ENPM612 System and Software Requirements (3 Credits)
Focus will be placed on the theoretical and practical aspects of requirements development. Students will recognize the place of requirements, how to work with users, requirements methods and techniques, the various requirements types, how to set requirements development schedules, requirements evolution, how to model and prototype requirements, how to evaluate and manage risk in requirements, techniques to test requirements, how to manage the requirements process, and how to write an effective requirements document.
Prerequisite: ENPM611.
Restriction: Permission of Maryland Applied Graduate Engineering.

ENPM613 Software Design and Architecture (3 Credits)
Covers the software design process, from understanding the need or problem, to creating suitable architecture and detailed design solutions, to preserving and evolving the design during implementation and maintenance. The main study topics include: requirements analysis models; user centered design; architecture design through decomposition and composition; architecture styles and architecture tactics for supporting various quality attributes such as security and usability; design for reuse and with reuse; detailed design object-oriented principles (such as SOLID) and design patterns; approaches for evaluating, comparing, and selecting design solutions; standard notations for documenting architecture views, detailed design, and analysis models; and industry standards for creating design deliverables. Students will acquire not only technical knowledge, but also soft skills such as communication, collaborations, critical thinking, leadership, negotiation, and time management.
Prerequisite: ENPM611.
Restriction: Permission of Maryland Applied Graduate Engineering.

ENPM614 Software Testing & Maintenance (3 Credits)
The purpose of this course is to provide an overview of software testing and maintenance and how these activities fit into the Software Engineering Life-Cycle. Many examples used in the lectures are derived from analysis of various NASA systems. Topics include various forms of testing such as Functional Testing, Combinatorial Testing, Structural Testing, Model-Based Testing, Security-oriented testing as well as Software Architecture's role in testability & maintainability, Regression Testing, Automated Testing, Testing Coverage including MC/DC coverage and testing standards.
Prerequisite: ENPM611.
Restriction: Permission of Maryland Applied Graduate Engineering.

ENPM615 Embedded Systems (3 Credits)
Introduction to embedded systems design and evaluation: requirements, specification, architecture, hardware and software components, integration and performance evaluation. Topics include instruction sets, CPU, embedded computing platform, program design and analysis, operating systems, hardware accelators, multiprocessors, networks, and system analysis. Real-life embedded systems design examples will be used throughput the course to illustrate these concepts.
Prerequisite: Must have completed undergraduate courses in logic design, computer architecture, and programming.

ENPM621 Heat Pumps and Beyond: Decarbonization Strategies and Software Tools for Modern Thermal Systems (3 Credits)
Thermal engineering of heat pump and refrigeration systems and thermal systems modeling. Thermodynamics and heat transfer. Cycle analysis, alternative refrigerants, graphical analysis using property charts. Analysis of applications such as space conditioning, food perservation, manufacturing, heat recovery and cogeneration.

ENPM622 Energy Conversion I - Stationary Power (3 Credits)
Thermal engineering of modern power generation systems. Cycle analysis of various modern power generation technologies including gas turbine, combined cycle, waste burning and cogeneration. Energy storage and energy transport.

ENPM623 Engineering Combustion Emissions for Air Pollution Control (3 Credits)
Analysis of the sources and mechanisms of combustion generated air pollution. Air pollution due to internal combustion engines, power generation and industrial emissions. Techniques to minimize and control emission.

ENPM624 Renewable Energy Applications (3 Credits)
Thermodynamics and heat transfer of renewable energy sources for heating, power generation and transportation. Wind energy, solar thermal, photovoltaic, biomass, waste burning, and hydropower. Broad overview of the growing use of renewable energy sources in the world economy with detailed analysis of specific applications.
Prerequisite: Knowledge of thermodynamics, fluid mechanics, and heat transfer.
Credit Only Granted for: ENPM624 or ENME701.

ENPM625 Heating, Ventilation and Air Conditioning of Buildings (3 Credits)
Fundamentals of heating, ventilation and air conditioning analysis and design. Thermodynamics, heat transfer and fluid mechanics principles applied to field problems. Quantitative analyses stressed. Topics include psychometrics, thermal loads, incompressible flow in ducts and pipes, heat exchangers, cooling towers, and refrigeration.
Prerequisite: Undergraduate thermodynamics, fluid mechanics and heat transfer.

ENPM626 Environmental Energy Security (3 Credits)
The overall objective of this course is to develop a toolkit to evaluate the energy security - and in particular, the environmental energy security - of available energy resources and conversion technologies, including those in current use, and those that might be used in the foreseeable future. Energy security is evaluated using a simple three-dimensional model based in the academic literature. This is an engineering class, and while we must occasionally delve into related economics and policy issues, we will focus on the core technical competencies in energy conversion needed to navigate the current world of energy.
Prerequisite: Must have completed undergraduate courses in thermodynamics and heat transfer.
Restriction: Permission of Maryland Applied Graduate Engineering.

ENPM627 Environmental Risk Analysis (3 Credits)
Covers fundamental aspects of environmental risk analysis and methods used to perform environmental risk analyses. Topics covered in the class include: establishing the scope of an analysis, developing alternate conceptual models, representing source term release, modeling contaminant transport in environmental media (e.g., surface water, groundwater, air), modeling food chains, conducting an exposure assessment, understanding basic human toxicology, characterizing the dose-response relationship, and effectively communicating about and managing risk. This course covers fundamental aspects of designing a risk analysis as well as common pitfalls to avoid and major sources of uncertainty in environmental risk analyses.

ENPM631 Advanced Networking (3 Credits)
Exploration of how such a variety of devices can use a big range of technologies to connect seamlessly to each other. In the second half of the course we translate the basic knowledge of the protocols to more hands-on exercises in containerization (Docker) and at the end we give an introduction to Kubernetes, that is an open-source system for automating deployment and management of containerized applications.
Prerequisite: ENPM694 or ENPM818O and ability to write code in one programming language and/or Undergraduate coursework in a programming language; or permission of instructor.
Restriction: Permission of Maryland Applied Graduate Engineering.

ENPM634 Penetration Testing (3 Credits)
This course offers a hands-on deep dive into advanced penetration testing and red teaming. Building on foundational security tools covered in the prerequisite course, students will learn to research and write custom exploits, move through networks post-exploitation, and practice operational security. The course also covers vulnerability disclosure and how to effectively communicate findings to both technical and executive audiences.
Prerequisite: ENPM685.
Recommended: Familiarity with Linux and Windows operating systems, as well as TCP/IP and basic networking concepts recommended.
Restriction: Permission of Maryland Applied Graduate Engineering.
Credit Only Granted for: ENPM809Q or ENPM634.
Formerly: ENPM809Q.

ENPM635 Thermal Systems Design Analysis (3 Credits)
Evaluates the trade-offs associated with thermal systems. Use of software for system simulation, evaluation and optimization. Applications include power and refrigeration systems, pipe flow systems, distillation columns, dehumidifying coils, and co-generation systems.
Prerequisite: Undergraduate courses in thermodynamics, fluid mechanics and heat transfer.
Credit Only Granted for: ENPM635 or ENME635.

ENPM636 Applied Additive Manufacturing (3 Credits)
In-depth understanding of Additive Manufacturing (AM) technologies and their applicability and limitations is important for future engineers and researchers in developing new engineering systems and identifying emerging opportunities in developing new products and processes. Real-life projects and the advancements that are realized through utilization of AM techniques will be presented in this course.
Credit Only Granted for: ENPM808G or ENPM636.
Formerly: ENPM808G.

ENPM637 Managing Software Engineering Projects (3 Credits)
Addresses the breadth of managing software engineering projects. It will help in transforming inspiring software engineers to software project leaders. The course will impart advanced principles, methods and tools for management of software projects in a realistic software engineering context. A hybrid project management will be taught with more focused on Agile Project Management paradigms. The course will also impart a cutting-edge scalable, modular, and integrated patterns of the Scaled Agile Framework (SAFe) 4.0 for the software engineering program and portfolios management. In addition, the course will also instill DevOps best practices to build much more responsible organizations that can move quickly in ever-changing circumstances. Methods for managing and optimizing the software development process are discussed along with techniques for performing each phase of the systems development lifecycle.
Credit Only Granted for: ENPM808E or ENPM637.
Formerly: ENPM808E.

ENPM640 Rehabilitation Robotics (3 Credits)
An introduction to a field of robotics dedicated to improving the lives of people with disabilities. The course is designed for students wishing to learn more about rehabilitation robotics, one of the fasting growing fields of robotics. Rehabilitation robotics is the application of robots to overcome disabilities resulting from neurologic injuries and physical trauma, and improve quality of life. This course considers not only engineering design and development, but also the human factors that make some innovative technologies successful and others commercial failures. Engineering innovation by itself, without considering other factors such as evidence-based R&D and product acceptance, may mean that some technologies don't become or remain available or are inefficacious to aid their intended beneficiaries. This course differs from medical robotics in its focus on improving the quality of life through robot-mediated rehabilitation treatments, rather than improving or enhancing applications such as surgical interventions.
Recommended: Basic understanding of linear time-invariant control systems (e.g. ENPM667) is preferred but not required. No background or previous experience in assistive robotics, human biomechanics, and/or neuroscience is required.
Credit Only Granted for: ENPM808J, ENPM640, or ENME444.
Formerly: ENPM808J.

ENPM645 Human-Robot Interaction (3 Credits)
To define the intersection of human-robot interactions to include human-computer interfaces, as well as robotic emotions and facial expressions emulations. The result will provide a basis for students to assess the best approaches for interacting effectively with robots. Areas to be covered include biologically-inspired robotics, cognitive robotics, cultural and social aspects of robotics, data mining, examples of human systems interfaces, and machine learning with respect to A.I. principles and limitations.
Recommended: Some knowledge of A.I. fundamentals and data analytics recommended, but not required.
Credit Only Granted for: ENPM808K or ENPM645.
Formerly: ENPM808K.

ENPM650 Solar Thermal Energy Systems (3 Credits)
Covers a review of related fundamentals, including limitations imposed by thermodynamics, solar spectral characteristics, measurement, and analytical models to predict solar irradiance with respect to time, location and orientation. The course will then examine the characteristics of various components in solar thermal systems with particular emphasis on flat plate and concentrating collectors, fixed and tracking collector systems, heat exchangers and thermal storage to understand how they work and how their performance is influenced by their design. The course will then lead to an examination of systems and system performance, including system design, predicted energy savings and related economics. The course will introduce low temperature applications such as solar hot water, space heating and water distillation, as well as concentrating solar energy for solar thermo-chemical processes to produce hydrogen and solar power generation systems. A project of importance to the development of Solar Thermal Power Systems will be assigned.
Prerequisite: Undergraduate level courses in thermodynamics, heat transfer, and fluid mechanics, at least one semester each.

ENPM651 Heat Transfer for Modern Application (3 Credits)
Presents the three modes of heat transfer: conduction, convection, and radiation. One- and two-dimensional steady-state and transient conductions are studied. The lumped capacitance analysis is used for transient conduction when suitable. Convection heat transfer is studied in both external and internal flow cases and under laminar and turbulent flow regimes. Free convection is also studied where the heat transfer is due to flow-induced by fluid buoyancy. Radiation heat transfer is studied by considering both the general characteristics of radiation along with the properties of radiating surfaces and radiation heat transfer between surfaces. For each subject, real engineering examples will be tackled by using Engineering Equations Solver and Coil Designer software. As an application of multi-mode heat transfer principles, the design and optimization of air-to-refrigerant heat exchangers are studied in the course.
Prerequisite: Undergraduate Transfer Processes.

ENPM652 Applied Finite Element Methods (3 Credits)
Introduces the Finite Element Method (FEM), widely used to perform analyses in areas such as structural/solid mechanics, fluid mechanics, heat transfer. This course presents an introduction to the mathematical and physical concepts underpinning the FEM framework. Additionally, ANSYS Workbench software will be used to demonstrate engineering-scale examples for stress and thermal analysis problems. There are no formal requirements for this course although students will benefit from a familiarity with basic concepts in linear algebra, calculus, differential equations, solid mechanics, and heat transfer.
Restriction: Must not have completed ENME674; and must not have completed ENAE652.
Credit Only Granted for: ENME674, ENAE652, or ENPM652.

ENPM654 Energy Systems Management (3 Credits)
Covers a wide range of energy management and energy efficiency topics including energy auditing, energy efficient lighting systems and motors, demand limiting and control, control strategies for optimization, direct digital control, integrated building automation systems, communication networks, distributed generation, cogeneration, combined heat and power, process energy management and the associated economic analyses. Included will be the latest internet based technologies for accessing real-time energy pricing and managing energy demand remotely for multiple buildings or campuses.
Recommended: Background in thermodynamics, fluid mechanics, and heat transfer is recommended.

ENPM655 AI-Based Software Systems (3 Credits)
The goal of this new course is to address the important problem of specifying, developing, and testing software systems that are based on artificial intelligence (AI) components.
Credit Only Granted for: ENPM808O or ENPM655.
Formerly: ENPM808O.

ENPM656 Energy Conversion II -- Mobile Power (3 Credits)
Designed to give students an understanding of the principles and design concepts associated with important fuel - engine aspects of modern and advanced mobility power systems. Emphasis is given to state of the art and emerging IC engine technologies such as those applied to modern and advanced automotive (i.e. self-propelled) vehicles. Electric Vehicles will also be explored.
Prerequisite: Must have completed undergraduate courses in thermodynamics, heat transfer, and fluid mechanics; or ENPM672.

ENPM657 Applied Cryptography (3 Credits)
The goal of this course is to provide students with a foundational understanding of cryptography as used in the real world. Students will learn about private-key encryption, message authentication codes, key-exchange protocols, public-key encryption, and digital signatures, in addition to learning about underlying primitives such as pseudorandom number generators, block ciphers, and hash functions. The course will also try to convey the "cryptographic mindset," including formal threat modeling and proofs of security. We will emphasize real-world usage of cryptography by covering standards and best practices, discussing attacks on deployed systems, and giving programming assignments meant to reinforce the concepts covered in class.
Prerequisite: A solid foundation in discrete mathematics, including probability, statistics, and linear algebra, along with basic programming skills and algorithm analysis.
Credit Only Granted for: ENPM809A or ENPM657.
Formerly: ENPM809A.

ENPM660 Wind Energy Engineering (3 Credits)
An examination of four central topics in wind energy engineering: the nature of wind energy as a resource for generating electricity; the aerodynamics of wind turbines by which the wind energy is converted into mechanical energy; the mechanics and dynamics of the wind energy system (tower, rotor, hub, drive train, and generator); and the electrical aspects of wind turbines. Additional topics to be included in the course include:Wind turbine design; wind turbine control; wind turbine siting, system design, and integration; Wind energy system economics; and wind energy systems environmental impacts and aspects. The course is intended to pass along substantial subject matter knowledge and skills, it can only be treated as an introduction to this extensive, multidisciplinary topic. However, students are expected to emerge with a substantial knowledge of wind energy systems and the methods used to analyze such systems.

ENPM661 Planning for Autonomous Robots (3 Credits)
Planning is a fundamental capability needed to realize autonomous robots. Planning in the context of autonomous robots is carried out at multiple different levels. At the top level, task planning is performed to identify and sequence the tasks needed to meet mission requirements. At the next level, planning is performed to determine a sequence of motion goals that satisfy individual task goals and constraints. Finally, at the lowest level, trajectory planning is performed to determine actuator actions to realize the motion goals. Different algorithms are used to achieve planning at different levels. This graduate course will introduce planning techniques for realizing autonomous robots. In addition to covering traditional motion planning techniques, this course will emphasize the role of physics in the planning process. This course will also discuss how the planning component is integrated with control component. Mobile robots will be used as examples to illustrate the concepts during this course. However, techniques introduced in the course will be equally applicable to robot manipulators.

ENPM662 Introduction to Robot Modeling (3 Credits)
This course introduces basic principles for modeling a robot. Most of the course is focused on modeling manipulators based on serial mechanisms. The course begins with a description of the homogenous transformation and rigid motions. It then introduces concepts related to kinematics, inverse kinematics, and Jacobians. This course then introduces Eulerian and Lagrangian Dynamics. Finally, the course concludes by introducing basic principles for modeling manipulators based on parallel mechanisms. The concepts introduced in this course are subsequently utilized in control and planning courses.
Recommended: Students should have intermediate programming skills (Python) and basic algebra knowledge for this course.

ENPM663 Building a Manufacturing Robotic Software System (3 Credits)
This hands-on course will look at the components of manufacturing robots, including architectures, planning/control, simulation, and measurement science. Students will explore the work that is being researched around the world in each of these areas, and will perform small hands-on exercises in most of the classes to gain a deeper understanding of how a selected set of these technologies can be applied to real-world challenges.
Recommended: Prior C++ or Python programming experience.
Credit Only Granted for: ENPM809B or ENPM663.
Formerly: ENPM809B.

ENPM664 Embedded System Hacking and Security (3 Credits)
The purpose of this course is to reveal the tools, techniques and procedures (TTPs) employed by adversaries to exploit and subvert the security of embedded systems. This course will cover the core concepts and techniques to analyze and characterize the behavior of embedded systems and platforms. Concepts will be introduced and discussed within the context of an adversary intent on altering or subverting the behavior of such systems. The course does not expect students to have any prior embedded systems experience.
Prerequisite: Prior programming experience, familiarity with computer architectures and reading assembly.
Restriction: Must have permission of Maryland Applied Graduate Engineering.
Credit Only Granted for: ENPM809I or ENPM664.
Formerly: ENPM809I.

ENPM665 Cloud Security (3 Credits)
Covers the fundamentals of securing cloud-based workloads from the ground up with many hands-on examples. Through these hands-on exercises the course will demonstrate where the similarities and differences are when securing the cloud compared to securing traditional IT.
Credit Only Granted for: ENPM809J or ENPM665.
Formerly: ENPM809J.

ENPM667 Control of Robotic Systems (3 Credits)
This is a basic course on the design of controllers for robotic systems. The course starts with mainstay principles of linear control, including a review of elementary concepts of systems, and discusses applications to independent joint control. The second part of the course introduces a physics-based approach to control design that uses energy and optimization principles to tackle the design of controllers that exploit the underlying dynamics of robotic systems. The course ends with an introduction to force control and basic principles of geometric control if time allows.

ENPM670 Energy Audits for Decarbonization and Sustainability Enhancement (3 Credits)
Provides students with fundamentals and applications of energy audit, modeling, and management in building energy systems. It will cover key definitions, units, the supply/demand fundamentals for the various energy sources, the challenges of decarbonization (across several sectors), drivers of energy demand in the buildings sector (residential, commercial, manufacturing), energy audit procedures for various types of systems, economics/life-cycle costing and more. Students will gain experience conducting energy audits through real-world project(s), different modeling tools (e.g. System Advisor Models), and data sources necessary to conduct core analyses across sectors will be covered.
Prerequisite: Prior knowledge of undergraduate basic thermodynamics and heat transfer.
Recommended: Knowledge of electrical systems and controls is desirable.

ENPM671 Advanced Mechanics of Materials (3 Credits)
Formulate and quantitatively state the mechanical/physical responses of structural components and configurations subjected to loads, temperature, pre-strains etc. The two methods of anlysis employed are the mechanics of materials approach and the theory of elasticity approach. Analysis and design of components of structural/machine systems as experienced in aeronautical, civil, mechanical and nuclear engineering.
Prerequisite: Undergraduate level knowledge of mechanics of materials.

ENPM672 Fundamentals for Thermal Systems (3 Credits)
Included in this course is an introduction to thermodynamics, fluid mechanics and heat transfer. Emphasis is on gaining an understanding of the physical concepts through the solving of numerical problems associated with simple thermal fluid processes and cycles. Both ideal gases and multiphase fluids will be considered as the working fluids.
Prerequisite: Undergraduate engineering, physics or chemistry degree.
Restriction: Permission of Maryland Applied Graduate Engineering.

ENPM673 Perception for Autonomous Robots (3 Credits)
This course offers a foundation in computer vision. Students will learn techniques and algorithms that can be used to solve an abundance of perception problems. This course is dedicated to anyone interested in giving their autonomous system (e.g., robot, autonomous driving car, or simply a smart camera) means to understand their surrounding world. Throughout the projects of this course students will gain hands-on experience in solving real-life problems such as lane detection for autonomous driving, computing velocities of moving objects, and building a 3D model of an object using 2D images from cameras. Moreover, students will gain experience with state-of-the-art tools such as programming using OpenCV, Python and introduction to Machine Learning using PyTorch.
Prerequisite: Must have completed or be concurrently enrolled in ENPM661; and must have proficiency in a programming language.
Recommended: Familiarity with Python.
Restriction: Permission of Maryland Applied Graduate Engineering (MAGE).

ENPM680 Introduction to Secure Coding for Software Engineering (3 Credits)
Covers core concepts and techniques to analyze and characterize such security bugs, and potential ways to mitigate them. Concepts will be introduced and discussed within the context of an adversary intent on altering or subverting the behavior of the software with security impacts.
Credit Only Granted for: ENPM809W or ENPM680.
Formerly: ENPM809W.

ENPM685 Security Tools for Information Security (3 Credits)
Students will perform host- and network-based security tasks relating to security, investigation, compliance verification and auditing using a wide selection of commonly used tools on both Windows and Linux platforms, with emphasis on open source tools.
Prerequisite: Familiarity with Linux and Windows operating systems, as well as TCP/IP and basic networking concepts.

ENPM686 Information Assurance (3 Credits)
The first half of lectures provides an overview of cybersecurity. One third of these lectures focuses on the fundamentals of cybersecurity like authentication, access control, and security models. The second third focuses on the practice of cybersecurity using Unix and Windows NT as case studies. The last third is dedicated to security in distributed systems including network security, and World Wide Web security.
The second half of the lectures focuses on the information assurance process. First, information assets are enumerated and classified. Second, the main vulnerabilities and threats are identified. Third, a risk assessment is conducted by considering the probability and impact of the undesired events. Finally, a risk management plan is developed that includes countermeasures involving mitigating, eliminating, accepting, or transferring the risks, and considers prevention, detection, and response.

ENPM687 Digital Forensics and Incidence Responses (3 Credits)
Students will implement a robust incident response methodology, including proper forensic handling of evidence, and cover legal aspects of national and international law regarding forensics. The bulk of the course covers evidence acquisition, preservation, analysis and reporting on multiple platforms.
Prerequisite: Experience with both Windows and Unix-based operating systems, including using the command line.

ENPM690 Robot Learning (3 Credits)
Machine learning may be used to greatly expand the capabilities of robotic systems, and has been applied to a variety of robotic system functions including planning, control, and perception. Adaptation and learning are particularly important for development of autonomous robotic systems that must operate in dynamic or uncertain environments. Ultimately we would like for the robots to expand their knowledge and improve their own performance through learning while operating in the environment (on-line and/or lifelong learning). This graduate course will explore the application of machine learning techniques, paradigms, and control design to robotic systems, focusing primarily on key useful representations and model building techniques for application in non-stationary robotic systems.
Prerequisite: Proficiency in at least one commonly used programming language (e.g., C++, Python, Java), CMSC422 (Intro to Machine Learning) or equivalent.
Credit Only Granted for: ENPM808F or ENPM690.
Formerly: ENPM808F.

ENPM691 Hacking of C programs and Unix Binaries (3 Credits)
Teaches the fundamentals of secure programming in C. An in depth discussion on various security vulnerabilities (e.g., buffer overflows) in C applications will be taught with hands-on demo of concepts during the class. Students will learn how a C program runs "under-the-hood". The course will teach nitty-gritty of C programs by analyzing at the assembly level. The course discusses best practices (e.g., coding standards) and design principles for secure programming so that security can be built-in during design time. In addition to assignments, students are required to present papers related to this course.
Prerequisite: ENEE150 or equivalent.

ENPM692 Manufacturing and Automation (3 Credits)
Covers automation and product realization, digital factories, and disruptive manufacturing technologies. The role of additive manufacturing, sustainability, and performance simulation in selected manufacturing scenarios will be explored alongside automation strategies for rapid product development.
Credit Only Granted for: ENPM808P or ENPM692.
Formerly: ENPM808P.

ENPM693 Network Security (3 Credits)
Introduction to various approaches to design security protocols used in data networks; familiarization with some current technologies. Security threats and countermeasures, communication security and basic encryption techniques, authentication protocols, data confidentiality and integrity, analysis of cryptographic protocols, and access control in large systems and networks.
Prerequisite: Networks & Protocols course or equivalent knowledge, and basic programming knowledge.
Credit Only Granted for: ENPM808N or ENPM693.
Formerly: ENPM808N.

ENPM694 Networks and Protocols (3 Credits)
Provides an in-depth review of the Internet with a focus on the end-to-end effects of technologies and protocols that operate in different layers. All protocols and technologies are covered in a holistic framework with an emphasis on their effect on the network and application performance. The course also includes a brief introduction of more modern concepts in the field of networking such as SDN and NFV to encourage deeper study of those topics.
Credit Only Granted for: ENPM694 or ENPM818O.

ENPM695 Secure Operating Systems (3 Credits)
Operating systems are the basic building block on which programmers build applications and on which security-minded professionals rely, whether they are monitoring activity on a computer, testing applications for security, or determining how malicious code affected their network. This course covers advanced topics in operating systems including process management and communication, remote procedure calls, memory management (including shared memory and virtual memory), checkpointing and recovery, file system, I/O subsystem and device management, distributed file systems and security. The course consists of reading and discussing research papers and includes a course project.
Prerequisite: ENPM691 and CMSC106; or permission of instructor.
Restriction: Permission of Maryland Applied Graduate Engineering.
Additional Information: This course assumes knowledge of C programming and a previous operating systems class or knowledge in various issues such as process management, process synchronization, the critical section problem, CPU scheduling, memory management, secondary storage management.

ENPM696 Reverse Software Engineering (3 Credits)
An in-depth understanding of software reverse engineering concepts and hands-on training with reverse engineering tools, including disassemblers, decompilers, and code analyzers. Students will become familiar with both low-level software and the x86 instruction set through binary reversing sessions. This course also provides insights into many subjects such as system security, source code analysis, software design, and program understanding that will be beneficial in a variety of fields.
Prerequisite: ENEE150 or equivalent.
Recommended: Proficiency with using a *nix command line in a shell of their choice, e.g., Bash, Zsh, csh. Ability to create and manage virtual machines running intel-based Linux and Windows distributions.

ENPM697 Secure Software Testing and Construction (3 Credits)
As software gets more complex, there is even more potential for vulnerabilities to remain in the production version. While traditional and emerging software testing methods are very good at detecting a large majority of "bugs" in the software, modifications to the methods are necessary to ensure vulnerabilities related to security are discovered and mitigated prior to release. In industry, there is also a cost-benefit analysis that determines the limits to pre-release testing, further enforcing the need to uniquely identify security vulnerabilities, potentially prioritizing their correction over other vulnerabilities. This course will cover methods of building security in from the beginning of development and testing the resulting software to ensure security vulnerabilities are detected. The course will use a mixture of textbook principles and research papers to cover the concepts. Students will also complete a course project.
Prerequisite: Permission of instructor; or (ENPM691 and CMSC106).
Restriction: Must have permission of the Maryland Applied Graduate Engineering office.

ENPM700 Software Development for Robotics (3 Credits)
Teaches the tools and processes to develop professional quality software for deployed systems and products. Students will learn the best practices of taking new ideas or prototypes, and understanding what it takes to build the complex software that is so important to today's commercialized robotic systems.
Prerequisite: ENPM702.
Restriction: Permission of Maryland Applied Graduate Engineering.
Credit Only Granted for: ENPM808X or ENPM700.
Formerly: ENPM808X.

ENPM701 Autonomous Robotics (3 Credits)
This is a hands-on course exploring the principles of robotic autonomy. Students will explore the theoretical, algorithmic, and implementation aspects of autonomous robotic modeling and controls, perception, localization and SLAM, planning, and decision making. These techniques will be applied through completion of a semester-long hands-on project employing the course material, ground-based mobile robots, and Python.
Restriction: Permission of Maryland Applied Graduate Engineering.
Credit Only Granted for: ENPM809T or ENPM701.
Formerly: ENPM809T.

ENPM702 Introductory Robot Programming (3 Credits)
This hands-on course will introduce students to the C++ programming language and is specifically designed for students who have had little to no programming experience in their previous studies.
Credit Only Granted for: ENPM809Y or ENPM702.
Formerly: ENPM809Y .

ENPM703 Fundamentals of AI and Deep Learning (3 Credits)
Fundamentals of machine learning techniques with a deep dive into cutting edge concepts that enabled neural networks to achieve state of the art performance in many visual, textual, and biomedical problems. Fundamental concepts like forward networks, convolution networks, recurrent neural networks, back propagation, loss functions, batch gradient descent, and stochastic optimization will be studied.
Prerequisite: Linear algebra; Fundamentals of programming; Fundamentals of statistics.
Credit Only Granted for: ENPM809K or ENPM703.
Formerly: ENPM809K.

ENPM808 Advanced Topics in Engineering (1-3 Credits)
Advanced topics selected by the faculty for students in the professional master of engineering program. May be taken for repeated credit when identified by topic title.

ENPM809 Special Topics in Engineering (3 Credits)
Special topics selected by the faculty for students in the professional master of engineering and graduate certificate in engineering program. May be taken for repeated credit when identified by topic title.
Repeatable to: 30 credits if content differs.

ENPM818 Variable Topics in Engineering (3 Credits)
Variable topics selected by the faculty for students in the professional master of engineering and graduate certificate in engineering program. May be taken for repeated credit when identified by topic title.
Repeatable to: 30 credits if content differs.

ENRE - Reliability Engineering

ENRE447 Fundamentals of Reliability Engineering (3 Credits)
Provides a general survey of the techniques of reliability engineering with a focus on theoretical basis and quantitative methods, with frequent examples of application. Topics include mathematical definition of reliability, probabilistic models to represent failure phenomena, statistical life models for non-repairable components, reliability data analysis, failure modes and effects analysis, risk analysis, and system reliability models including fault trees, event trees. Students will learn how to apply these techniques to problems related to engineering systems, with example cases for process plants, energy systems and infrastructure.
Prerequisite: Minimum grade of C- in MATH141 and MATH246.
Restriction: Must be a student in the Clark School of Engineering.
Additional Information: Questions about permission for the course should be directed to enmeundergrad@umd.edu.

ENRE489 Special Topics in Reliability Engineering (3 Credits)
Selected topics of current importance in reliability engineering.
Prerequisite: Permission of ENGR-Mechanical Engineering department.
Repeatable to: 6 credits if content differs.

ENRE600 Fundamentals of Failure Mechanisms (3 Credits)
Advanced failure mechanisms in reliability engineering wiil be taught from a basic materials and defects point of view. The methods of predicting the physics of failure of devices, materials, components and systems are reviewed. The main emphasis will be given to basic degradation mechanisms through understanding the physics, chemistry, and mechanics of such mechanisms. Mechanical failures are introduced through understanding fatigue, creep and yielding in materials, devices and components. The principles of cumulative damage and mechanical yielding theory are taught. The concepts of reliability growth, accelerated life testing, environmental testing are introduced. Physical, chemical and thermal related failures are introduced through a basic understanding of degradation mechanisms such as diffusion, electromigration, defects and defect migration. The failure mechanisms in basic material types will be taught. Failure mechanisms observed in real electronic devices and electronic packaging will also be presented. Problems related to manufacturing, and microelectronics will be analyzed. Mechanical failures are emphasized from the point of view of complex fatigue theory.
Cross-listed with: ENMA626.
Credit Only Granted for: ENMA626 or ENRE600.

ENRE602 Principles of Reliability Analysis (3 Credits)
Principal methods of reliability analysis, including fault tree and reliability block diagrams; Failure Mode and Effects Analysis (FMEA); event tree construction and evaluation; reliability data collection and analysis; methods of modeling systems for reliability analysis. Focus on problems related to process industries, fossil-fueled power plant availability, and other systems of concern to engineers.

ENRE620 Mathematical Techniques of Reliability Engineering (3 Credits)
Basic probability and statistics. Application of selected mathematical techniques to the analysis and solution of reliability engineering problems. Applications of matrices, vectors, tensors, differential equations, integral transforms, and probability methods to a wide range of reliability related problems.

ENRE640 Collection and Analysis of Reliability Data (3 Credits)
Reliability data collection and analysis is of high (practical) importance in many essential engineering tasks including but not limited to: design alternatives evaluation, failure root cause analysis, early detection of field reliability problems, warranty reserve allocation, and others. The course teaches nonparametric and parametric statistical procedures of reliability data analysis for both non-repairable and repairable systems. It covers test data analysis (including accelerated and degradation testing), field data analysis (including warranty data and connected fleets data). Machine learning methods in reliability data analysis are discussed as well, along with special topics on condition-based maintenance and prognostics.
Prerequisite: ENRE602.

ENRE641 Probabilistic Physics of Failure and Accelerated Testing (3 Credits)
Models for life testing at constant stress. Graphical and analytical methods. Test plans for accelerated testing. Competing failure modes and size effects. Models and data analyses for step and time varying stresses. Optimizing of test plans.

ENRE642 Reliability Engineering Management (3 Credits)
Unifying systems perspective of reliability engineering management. Design, development and management of organizations and reliability programs including: management of systems evaluation and test protocols, development of risk management-mitigation processes, and management of functional tasks performed by reliability engineers.

ENRE645 Human Reliability Analysis (3 Credits)
Methods of solving practical human reliability problems, cognitive and behavioral modeling, task analysis, performance shaping factors, error classification, distribution of human performance and uncertainty bounds, sources of human error probability data, human error risk mitigation, examples and case studies.

ENRE648 Special Problems in Reliability Engineering (1-6 Credits)
For students who have definite plans for individual study of approved problems. Credit given according to extent of work.
Repeatable to: 6 credits if content differs.

ENRE655 Machine Learning Algorithms for Reliability Engineering (3 Credits)
Students learn representative machine learning algorithms with applications to reliability engineering. This course will cover model-based methods for reliability analysis, reliability model parameter estimation with both maximum likelihood approaches and Bayesian approaches, model selection, and model-based methods for health monitoring and reliability prediction. This course will also cover data-driven methods for reliability analysis, including neural networks, deep neural networks, random forest, support vector machines. Lastly, this course will cover topics on decision optimization based on reliability analysis, focusing on the Markov decision process and reinforcement learning.
Prerequisite: ENRE602.

ENRE670 Probabilistic Risk Assessment (3 Credits)
Why study risk, sources of risk, overview of Risk Assessment and Risk Management, relation to System Safety and Reliability Engineering; measures, representation, communication, and perception of risk; overview of use of risk assessment results in decision making; overview of Probabilistic Risk Assessment (PRA) process; detailed converge of PRA methods including (1) methods for risk scenario development such as identification of initiators, event sequence diagrams, event trees, causal modeling (fault trees, influence diagrams, and hybrid methods), and simulation approaches; (2) methods of risk scenario likelihood assessment, including quantitative and qualitative approaches, as well as uncertainty modeling and analysis. Also covers methods for risk modeling of system hardware behavior, physical phenomena, human behavior, software behavior, organizational environment, and external physical environment. Additional core topics include risk model integration and quantification (Boolean-based, binary decsion diagram, Bayesian belief networks, and hybrid methods), simulation-based Dynamic PRA methods (discrete and continuous) and several examples of large scale PRAs for space missions, nuclear power, aviation and medical systems.
Prerequisite: ENRE602.

ENRE671 Risk Assessment in Engineering (3 Credits)
Introduction to risk management and decision-making, including uncertainty propagation, importance ranking, risk acceptance criteria, decision analysis and other decsion-making techniques, risk communication.
Prerequisite: ENRE670.

ENRE682 Software Reliability and Integrity (3 Credits)
Defining software reliability, initiatives and standards on software reliability, inherent characteristics of software which determine reliability, types of software errors, structured design, overview of software reliability models, software fault tree analysis, software redundancy, automating tools for software reliability protypes and real time software reliability.

ENRE684 Information Security (3 Credits)
This course is divided into three major components: overview, detailed concepts and implementation techniques. The topics to be covered are: general security concerns and concepts from both a technical and management point of view, principles of security, architectures, access control and multi-level security, trojan horses, covert channels, trap doors, hardware security mechanism, security models, security kernels, formal specifications and verification, networks and distribution systems and risk analysis.
Jointly offered with: ENME442.
Credit Only Granted for: ENME442 or ENRE684.

ENRE695 Design for Reliability (3 Credits)
Reliability is the ability of a product or system to perform as intended (i.e., without failure and within specified performance limits) for a specified time, in its life-cycle conditions. Knowledge of reliability concepts and principles, as well as risk assessment, mitigation and management strategies prepares engineers to contribute effectively to product development and life cycle management. This course teaches the fundamental knowledge and skills in reliability as it pertains to the design, manufacture, and use of electrical, mechanical, and electro-mechanical products. Topics cover the suitability of the supply chain members to contribute towards development, manufacturing, distribution and support of reliable products; efficient and cost-effective design and manufacture of reliable products; process capability and process control; derating, uprating, FMMEA, reliability prediction and reliability allocation; how to plan and implement product testing to assess reliability; how to analyze degradation, failure, and return data to estimate fundamental reliability parameters; root cause analysis; and reliability issues associated with warranties, regulatory requirements, and liabilities.
Cross-listed with: ENME695.
Credit Only Granted for: ENME695 or ENRE695.

ENRE770 Life Cycle Cost and System Sustainment Analysis (3 Credits)
This course melds elements of traditional engineering economics with manufacturing process and sustainment modeling, and life cycle cost management concepts to form a practical foundation for predicting the cost of products and systems. Various manufacturing cost analysis will be presented including: process-flow, parametric, cost of ownership, and activity based costing. The effects of learning curves, data uncertainty, test and rework processes, and defects will be considered. Aspects of system sustainment including the impact on the life cycle (and life cycle costs) of reliability, maintenance, environment impact, and obsolescence will be treated.
Credit Only Granted for: ENME770 or ENRE770.

ENRE799 Master's Thesis Research (1-6 Credits)

ENRE898 Pre-Candidacy Research (1-8 Credits)

ENRE899 Doctoral Dissertation Research (1-8 Credits)

ENSE - Systems Engineering

ENSE621 Systems Engineering Concepts and Processes: A Model-Based Approach (3 Credits)
An INCOSE-oriented introduction to model-based systems engineering. Provides an overview of systems engineering concepts, processes and methods, with a particular focus on: the development of stakeholder and system requirements; characteristics of well-written requirements; the use of SysML software tools to develop of system- and element-level architectures; and the relationship between requirements and architecture. Architecture-related topics include specification and visualization of system attributes, behavior, and interfaces. Other topics include acquisition and development life cycle models; operational concepts and use cases; requirements and design traceability; analysis, modeling and simulation; systems engineering management; risk management; configuration management; systems-of-systems; and system complexity. The course includes a class project in which teams of 3-5 students use SysML to develop stakeholder requirements, system requirements, and a logical system architecture for an engineered system of interest to them and then perform a design trade-off analysis for some aspect of the system.
Restriction: Permission of ENGR-Institute for Systems Research.
Credit Only Granted for: ENPM641 or ENSE621.

ENSE622 System Trade-off Analysis, Modeling, and Simulation (3 Credits)
This course continues the model-based approach to systems engineering by introducing students to a variety of mathematical modeling and simulation techniques used to perform system performance, optimization, and trade-off analyses. Topics include: linear and integer programming; state machine models of finite state machines; development of simple intelligent agents; modeling Markov processes; queueing theory; multi-objective trade-off analyses; decision trees; stochastic (Monte Carlo) simulation, linear regression, some predictive analytic techniques; and an introduction to control theory. Mathematical models and simulations are developed and executed using MATLAB. The course includes a class project in which students solve a problem of interest to them using one or more of techniques addressed in class.
Prerequisite: Permission of ENGR-Institute for Systems Research; and ENSE621.
Recommended: Familiarity with calculus, probability, linear algebra, differential equations, & computer programming recommended.
Credit Only Granted for: ENPM642 or ENSE622.

ENSE623 System Development, Verification, and Validation (3 Credits)
This course completes the ENSE621, ENSE622 sequence. It covers system simulation development and a variety of verification and validation topics. It addresses development testing and operational testing; test methodologies; the planning of test programs and Test and Evaluation Master Plans (TEMPs); the planning and execution of tests; and the writing of test plans and test reports. Topics include verification methods; specification-based testing; test verification matrices; model-based verification; model checking and other formal approaches to verification; design of experiments; performance testing; reliability testing; usability/human factors testing; and other types of testing. The course includes a class project in which teams of 3-5 students: develop requirements for a simulation that supports a system analysis of interest (the user need); develop the simulation (in MATLAB); verify that it meets its requirements; and validate that it may be used to support the analysis of interest.
Prerequisite: Permission of ENGR-Institute for Systems Research; and ENSE622.
Credit Only Granted for: ENPM643 or ENSE623.

ENSE624 Human Factors in Systems Engineering (3 Credits)
This course covers the general principles of human factors, or ergonomics as it is sometimes called. Human Factors (HF) is an interdisciplinary approach for dealing with issues related to people in systems. It focuses on consideration of the characteristics of human beings in the design of systems and devices of all kinds. It is concerned with the assignment of appropriate functions for humans and machines, whether the people serve as operators, maintainers, or users of the system or device. The goal of HF is to achieve compatibility in the design of interactive systems of people, machines, and environments to ensure their effectiveness, safety and ease of use.
Restriction: Permission of ENGR-Institute for Systems Research.
Credit Only Granted for: ENPM644 or ENSE624.

ENSE626 System Life Cycle Analysis and Risk Management (3 Credits)
This course covers topics related to estimating the costs and risks incurred through the lifetimes of projects, products and systems. In addition, treatment is given to methods that determine the drivers of costs and risks and facilitate determination of the most effective alternatives to reducing them. Also covered, are relevant analytic tools from probability and statistics and also important managerial and organizational concepts. Extensive use is made of case studies and examples from industry and government.
Prerequisite: Permission of ENGR-Institute for Systems Research.

ENSE627 Systems Quality and Robustness Analysis (3 Credits)
This course covers systems engineering approaches for creating optimal and robust engineering systems and for quality assurance. It provides an overview of the important tools for quality analysis and quality management of engineering systems. These tools are commonly used in companies and organizations. Focus is placed on the Baldrige National Quality Program, ISO 9000 certification, six-sigma systems, and Deming total quality management to examine how high quality standards are sustained and customer requirements and satisfactions are ensured. The Taguchi method for robust analysis and design is covered and applied to case studies. Issues of flexible design over the system life cycle are addressed. Statistical process control, international standards for sampling, and design experimentation are also studied.
Restriction: Permission of ENGR-Institute for Systems Research.
Credit Only Granted for: ENPM647 or ENSE627.

ENSE698 Special Topics in Systems Engineering (3 Credits)
Prerequisite: ENSE621; and permission of ENGR-Institute for Systems Research.
Repeatable to: 6 credits if content differs.

ENSE699 Directed Study in Systems Engineering (1-3 Credits)
Directed study in Systems Engineering.
Prerequisite: ENSE621, ENSE622, and ENSE623.
Repeatable to: 3 credits if content differs.

ENSE799 Systems Engineering Thesis (1-6 Credits)
The application of systems engineering concepts, principles, and theories will be applied to the Master's Thesis project. Project/thesis work will be defined and selected early in student's program and supervised by a university faculty mentor.
Prerequisite: Permission of ENGR-Institute for Systems Research; and ENSE621; and must have 6 additional credits totaling 9 credit hours.
Repeatable to: 6 credits.

ENSP - Environmental Science and Policy

ENSP400 Capstone in Environmental Science and Policy (3 Credits)
Integration of physical, biological, and social sciences with applications to environmental science and policy. Problem-solving and multi-disciplinary case study evaluations pertinent to contemporary and future issues related to the environment.
Prerequisite: ENSP101; and ENSP102.
Restriction: Must be in Environmental Science and Policy program; and senior standing; and permission of the Environmental Science and Policy Program.

ENSP489 Special Topics in Environmental Science and Policy (1-3 Credits)
A lecture and or laboratory series organized to study a selected phase of Environmental Science and Policy not covered by existing courses. Credit according to time scheduled and organization of the course.
Repeatable to: 6 credits if content differs.

ENSP499 Honors Thesis Research (1-6 Credits)
Individual research, thesis, and oral defense. The research project will be conducted under the supervision of a faculty member.
Restriction: Must be in the ENSP Honors program; and permission of AGNR-Dean-Environmental Science & Policy Program.
Repeatable to: 6 credits.

ENSP699 Special Topics in Environmental Science and Policy (1-6 Credits)
Independent study course.
Prerequisite: Permission of AGNR-Dean-Environmental Science & Policy Program.
Restriction: Permission of instructor; and permission of AGNR-Dean-Environmental Science & Policy Program.
Repeatable to: 6 credits.

ENST - Environmental Science and Technology

ENST403 Invasive Species Ecology (3 Credits)
We will examine ecological, evolutionary, and anthropogenic processes facilitating or resisting biological invasions, and consider their environmental, economic, and human health impacts. We will consider various management strategies to mitigate invasions and identify areas of future research. Field trips and detailed discussion of recent findings and controversies in the literature will help illustrate fundamental concepts of invasions among various ecosystems.
Credit Only Granted for: ENST403, ENST603, or ENST689R.

ENST404 Ecological and Natural Resources Ethics (3 Credits)
Bridges science and management with ethical theory and concepts to help scientists, regulators, and managers understand how to deal with potential ethical dilemmas that arise in natural resource and environmental management implementation and policy development.
Prerequisite: ENST214 and ENST360.
Recommended: ENST314, ENST410, and ENST460.
Restriction: Senior standing or higher. Jointly offered with ENST604.
Credit Only Granted for: ENST604 or ENST404.

ENST405 Energy and Environment (3 Credits)
Introduction to the role of energy in environmental and human-dominated systems. Discussion of the historical and modern production and consumption of energy. Introduction to energy systems computer simulation and energy auditing.
Prerequisite: MATH140 or MATH120; or must have completed MATH220.
Restriction: Junior standing or higher. And must be in Environmental Sci & Tech program; or must be in Environmental Sci & Tech: Ecological Tech Design program; or must be in Environmental Sci & Tech: Environmental Health program; or must be in Environmental Sci & Tech: Soil & Watershed Science program; or must be in Environmental Sci & Tech: Natural Resources Mgmt program. Jointly offered with ENST605.
Credit Only Granted for: ENST405, ENSP350, ENST605, or MEES698Z.

ENST410 Ecosystem Services: An Integrated Analysis (3 Credits)
The importance of our ecosystems and the services they provide will be discussed. Basic principles used to analyze ecosystem services will be discussed and applied using case studies & field exercises. Forestland, wetlands and our marine resources are increasingly recognized for their ecosystem services provided to society, to include clean air and water, wildlife habitat, biodiversity, carbon storage and pollination services. This course will prepare students to deal with the complex issues involved in understanding those and other ecosystem services and their importance to society and environmental sustainability. Slowly, new markets are emerging for these services. Students will analyze the ecological, policy and financial dimensions of enhancing, restoring, and sustaining ecosystem services. New and on-going government programs and private business ventures will be discussed.
Prerequisite: ENST360 or BSCI361; or permission of instructor.
Restriction: Must be in one of the following programs (Environmental Sci & Tech: Ecological Tech Design; Environmental Sci & Tech; Environmental Sci & Tech: Natural Resources Mgmt; Environmental Sci & Tech: Soil & Watershed Science; Environmental Sci & Tech: Environmental Health).

ENST411 Principles of Soil Fertility (3 Credits)
Soil factors affecting plant growth and quality with emphasis on the bio-availability of mineral nutrients. The management of soil systems to enhance plant growth by means of crop rotations, microbial activities, and use of organic and inorganic amendments.
Prerequisite: ENST200; or students who have taken courses with comparable content may contact the department. Jointly offered with ENS T611.
Credit Only Granted for: ENST411 or NRSC411.
Formerly: NRS C411.

ENST414 Soil Morphology, Genesis and Classification (4 Credits)
Processes and factors of soil genesis. Taxonomy of soils of the world by U.S. System. Soil morphological characteristics, composition, classification, survey and field trips to examine and describe soils.
Prerequisite: Must have completed or be concurrently enrolled in ENST200.

ENST415 Renewable Energy (3 Credits)
An overview of renewable energy technologies and their current applications. Emphasis will be placed on technological readiness, efficiency and sustainability of renewable energy alternatives. Technologies include solar thermal, photovoltaics, biodiesel, ethanol, anaerobic digestion, wind, hydroelectric, and microbial fuel cells.
Prerequisite: CHEM131, PHYS121, and MATH113; or permission of AGNR-Environmental Science & Technology department.

ENST417 Soil Hydrology and Physics (3 Credits)
A study of soil water interactions: the hydrologic cycle; the unique properties of water and soil; the soil components and their interactions; the field water cycle; transport processes involving water, heat and solutes; human effects on soil and groundwater; as well as the measurement, prediction, and control of the physical processes taking place in and through the soil.
Prerequisite: ENST200; and (MATH113 or MATH115).

ENST421 Soil Chemistry (4 Credits)
The chemistry and composition of mineral and organic colloids in soils, including ion exchange, oxidation-reduction, acidity, surface charge, and solution chemistry. Lectures and readings pertain to plant nutrition, waste disposal, and groundwater quality.
Prerequisite: ENST200.

ENST422 Soil Microbial Ecology (3 Credits)
The interdisciplinary study of soil microorganisms and their interactions with the mineral matrix; resulting in processes such as nutrient cycling, decontamination, and natural product production. We will focus on the diversity of soil communities, their survival strategies, and the new strategies used to study these communities.
Prerequisite: ENST200; or 1 course in BCHM; or must have completed a course in microbiology; or students who have taken courses with comparable content may contact the department.
Jointly offered with: ENST622.

ENST423 Soil-Water Pollution (3 Credits)
Reaction and fate of pesticides, agricultural fertilizers, industrial and animal wastes in soil and water with emphasis on their relation to the environment.
Prerequisite: CHEM131 and CHEM132; or permission of instructor.

ENST430 Wetland Soils (3 Credits)
The soils of wetlands including hydrology, chemistry, and genesis are discussed. Federal and regional guidelines for wetland soils are covered with an emphasis on validating interpretations through field observations.
Prerequisite: ENST200.
Credit Only Granted for: ENST430 or ENST630.

ENST432 Environmental Microbiology (3 Credits)
Microorganisms are everywhere and mediate many of the processes that we observe everyday. These organisms are the unseen catalysts for numerous industrial processes and are critical to many emerging technologies and novel products. Environmental microbiologists ask: How do microorganisms in the environment benefit society? This course will answer this question by examining microbes in bioremediation, food safety, climate change, and biotechnology.
Prerequisite: CHEM131 and CHEM132.

ENST434 Toxic Contaminants: Sources, Fate, and Effects (3 Credits)
Study of the release to the environment, transport through natural compartments, persistence and ultimate fate of various classes of contaminants produced as a result of human activities. Topics will culminate in discussions of impacts to wildlife and human health. Students should emerge with a practical appreciation of the actual risks from exposure to a variety of environmental contaminants and an understanding of the environmental and human health implications of continuing the contaminating activities.
Prerequisite: ENST333 and ENST334.

ENST436 Emerging Environmental Threats (3 Credits)
Examine new and potential environmental concerns in the air, water, soil, space, and the built environment. Emphasis on studying the intrinsic links between ecosystem and human health. Topics will include climate change, resource consumption, biodiversity change, infectious disease, non-traditional pollutants, and other complex and significant environmental concerns.
Prerequisite: ENST233; or permission of AGNR-Environmental Science & Technology department.

ENST441 Sustainable Agriculture (3 Credits)
Environmental, social and economic needs for alternatives to the conventional, high-input farming systems which currently predominate in industrial countries. Strategies and practices that minimize the use of non-renewable resources.

ENST445 Ecological Risk Assessment (3 Credits)
Assessment of ecological impacts of perturbations on natural systems. Course will describe methods for estimating environmental impacts including extrapolating from laboratory and field data. The role of regulatory agencies and implications of scientific uncertainty on risk management will be covered.
Prerequisite: ENST360 or BSCI361; and (BIOM301 and ENST334).

ENST450 Wetland Ecology (3 Credits)
Plant and animal communities, biogeochemistry, and ecosystem properties of wetlands. Lectures are supplemented by field trips and in-class labs. Hands-on activities include identification of wetland plant species, wetland delineation, and collection and analysis of field data on wetland vegetation, soil, and hydrology. Wading boots (at least hip length) are strongly recommended.
Prerequisite: BIOM301 and ENST360, or equivalent courses in data analysis and ecology; or permission of AGNR-Environmental Science & Technology department.
Jointly offered with: ENST650.
Credit Only Granted for: ENST450, ENST650, or MEES650.

ENST452 Wetland Restoration (3 Credits)
Design, construction, and evaluation of wetlands restored or created to provide ecosystem services or to mitigate losses due to development. Topics include fundamental properties of wetlands, ecological restoration theory, site selection and goal-setting, design plans, practices for establishing wetland hydrology, substrate, and vegetation, and restored ecosystem monitoring.
Prerequisite: (BSCI160 and BSCI161; or BSCI106); and (BSCI362, ENST450, ENST360, or BSCI361).

ENST453 Watershed Science: Water Balance, Open Channel Flow, and Near Surface Hydrology (3 Credits)
Definition and delineation of watersheds based on the stream orders. Discussion of the principle of conservation of mass in the context of life cycles (water cycle, carbon cycle, photosynthesis, aerobic cycle, anaerobic cycle, and nitrogen cycle) as it relates to our Biosystem. Conceptual study of hydrologic cycle components and their prediction using empirical and physical-based models is covered. Role of water as the dynamic force within the context of its interaction with landscapes of diverse geology and land cover will be discussed. Elements of watershed management is discussed.
Prerequisite: MATH120, ENST200, GEOG306 or BIOM301.
Recommended: PHYS121.
Credit Only Granted for: ENST453 or ENST653.

ENST456 Spatial Analysis and Ecological Sampling (3 Credits)
Teaches ENST students ecological sampling methods and applied spatial analysis skills. Students will work in small groups on research projects they develop and test during the semester. Students will develop a research hypothesis, test their hypothesis, display it visually in QGIS, and analyze it with appropriate statistical methods in QGIS and R Studio culminating in a final presentation.
Recommended: GEOG306 and GEOG373.
Restriction: Senior standing or higher; and permission of instructor.
Additional Information: Students will need to provide an 8GB (or larger) thumb drive for data storage.

ENST460 Principles of Wildlife Management (3 Credits)
Ecological principles and requirements of wildlife as basis for management, and introduction to the scientific literature. Conflicts in wildlife management, government administration of wildlife resources, legislation, and history of the wildlife management profession.
Prerequisite: Must have completed two semesters of biology laboratory; and (ENST360; or BSCI361). Or permission of AGNR-Environmental Science & Technology department.

ENST461 Urban Wildlife Management (3 Credits)
Ecology and management of wildlife in urban areas. For students in biological sciences, geography, landscape design, natural resources management, recreation and urban studies. Planning, design, and wildlife conservation in landscape ecology. Public attitudes, preferences, and values, review of private conservation organizations.

ENST462 Field Techniques in Wildlife Management (3 Credits)
Hands-on experience with field techniques in wildlife management focusing on various methods of conducting indices, estimates, and censuses of wildlife populations. Includes capture and handling of amphibians, reptiles, birds, and mammals by use of drift fences, cover boards, mist nets, box traps, and dart guns.
Prerequisite: ENST460. And BSCI160 and BSCI161; or BSCI106. And BSCI170 and BSCI171; or BSCI105.
Recommended: ENST461.
Restriction: Permission of AGNR-College of Agriculture & Natural Resources.

ENST470 Ideas into Impact (3 Credits)
This will be a capstone-type course based around developing proposals for projects emphasizing research, monitoring, design, restoration, managament, entrepreneurship, or other approaches to ecological or environmental questions, issues, or problems.
Restriction: Junior or Senior standing only; Permission of AGNR-Environmental Science & Technology department.

ENST472 Capstone (3 Credits)
This capstone course focuses on professional project preparation, presentation, and critical evaluation on environmental science research. Students will develop and present original projects and critique projects presented by others.
Restriction: Must be in a major within AGNR-Environmental Science & Technology department; and permission of AGNR-Environmental Science & Technology department.
Additional Information: This is the pinnacle course for students majoring in ENST and is therefore recommended in one of the students' final semesters.

ENST481 Ecological Design (4 Credits)
An advanced survey course on the field of ecological design. Principles of design are illustrated with case studies from biologically-based waste treatment systems, ecosystem management and sustainable development. Concepts covered include ecology, ecological engineering, nutrient cycling, emergy, lifecycle analysis, and design process. Technologies include treatment wetlands, living machines, anaerobic digestion, rain gardens, bioswales, bioremediation, algal turf scrubbers, and green building design.
Prerequisite: (MATH120 or MATH140; or must have completed MATH220); and (PHYS121 and CHEM131); and (BSCI361; or students who have taken courses with comparable content may contact the department). Or permission of instructor.
Jointly offered with: MEES681.
Restriction: Permission of AGNR-Environmental Science & Technology department.
Credit Only Granted for: ENST481, ENST681, or MEES681.

ENST485 Water Management in Urban Environment (3 Credits)
In this course we explore relevant processes in pathways and fluxes of water in urban areas; urban water balance and consequences of urbanization on surface and groundwater regimes; effects of climate and hydrology; quantity and quality of urban runoff, sources of pollution and behavior of contaminants; and ecological quality and processes associated with urban water. We study design and planning for water quality and quantity management in urban water systems; and engineered and ecologically engineered alternatives for stormwater management. Additionally, we look at the climate impacts on the urban water cycle.
Prerequisite: MATH120, MATH136, or MATH140.

ENST486 Senior Professional Experience (3 Credits)
Students will arrange an off-campus professional-level work experience related to Environmental Science and Technology (ENST) to develop expertise in a specific area of their ENST concentration curriculum. Classroom sessions will frame student experiences within the broader discipline of Environmental Science and Technology. This course will tie together current practices in the ENST career industry, proposal writing, critical analysis, and culminate in a final paper and presentation.
Prerequisite: ENST389.
Restriction: Must be in the Environmental Science and Technology program; and permission of AGNR-Environmental Science & Technology department.
Additional Information: The course has two types of activities: lecture and experiential learning. Students are expected to work on their professional-level experience for 90 hours and participate in a 2-hour lecture every other week, during the semester to develop their Senior Integrative Experience (SIE) project. Each student's research question, proposal methodology, analysis, paper, and presentation will follow learning outcomes of all ENST SIE course options.

ENST487 Environmental Conflicts and Decision Making (2 Credits)
Study major cases which focus on environmental science with concentration on the role and techniques of negotiation, collaborative decision making, and adaptive resource management as an environmental conflict resolution process.
Restriction: Senior standing. And must be in one of the following programs (Environmental Sci & Tech: Natural Resources Mgmt; Environmental Sci&Pol-Wildlife Ecology & Mgmt) ; or permission of AGNR-Environmental Science & Technology department.

ENST489 Research Experience (3 Credits)
An advanced research-based course in the field of environmental science and technology.
Restriction: Permission of AGNR-Environmental Science & Technology department.
Repeatable to: 6 credits.

ENST499 Special Topics in Environmental Science and Technology (1-4 Credits)
An independent study, and/or lecture, and/or laboratory series organized to study a selected phase of Environmental Science and Technology not covered by existing courses. Credit arranged with supervising faculty member.
Restriction: Permission of AGNR-Environmental Science & Technology department.

ENST602 Research Principles and Methodology in Environmental Scienceand Technolgy (3 Credits)
Fundamental research strategies and methods of investigation in Environmental Science and Technology including field and laboratory procedures.
Restriction: Must be in Environmental Sci & Tech program.

ENST603 Advanced Invasive Species Ecology (3 Credits)
We will examine ecological, evolutionary, and anthropogenic processes facilitating or resisting biological invasions, and consider their environmental, economic, and human health impacts. We will consider various management strategies to mitigate invasions and identify areas of future research. Field trips and detailed discussion of recent findings and controversies in the literature will help illustrate fundamental concepts of invasions among various ecosystems.Jointly offered with ENST403.
Credit Only Granted for: ENST403, ENST603 , or ENST689R.
Formerly: ENST689R.
Additional Information: Two field trips are planned for this class.

ENST604 Advanced Ecological and Natural Resource Ethics (3 Credits)
Bridges science and management with ethical theory and concepts to help scientists, regulators, and managers understand how to deal with potential ethical dilemmas that arise in natural resource and environmental management implementation and policy development.
Prerequisite: ENST214 and ENST360.
Recommended: ENST314, ENST410, and ENST460.
Credit Only Granted for: ENST404 or ENST604.

ENST605 Energy and Environment (3 Credits)
Role of energy in environmental and human-dominated systems and their linkage. Discussion of the historical and modern production and consumption of energy. Energy systems simulation modeling, energy analysis and energy auditing. Review of national energy policies and proposed alternatives.
Prerequisite: MATH120; or must have completed MATH220; or students who have taken courses with comparable content may contact the department. Jointly offered with ENST405.
Credit Only Granted for: ENST405, ENST605 , or MEES698Z.
Formerly: MEES698Z.

ENST606 Advanced Ecosystem Health and Natural Resource Management (3 Credits)
Explore some of the most important and current global environmental and health challenges. Investigate fundamental and new concepts from the fields of ecology, eco-epidemiology, social anthropology, and environmental and health policy, as well as interdisciplinary cross-sectorial approaches such as One Health, Eco-Health, and Planetary Health.
Restriction: Permission of AGNR-Environmental Science & Technology department.
Credit Only Granted for: ENST606 or ENST689E.
Formerly: ENST689E.
Additional Information: Priority in enrollment will be given to students in ENST program.

ENST607 Adaptation and Resilience in Cities (3 Credits)
Knowledge about the relations between urbanization and global and local challenges, such as climate change, biodiversity loss, resource deficiency, poverty, justice and health, is of key importance to move towards sustainable development and resilient systems. This course takes a trans-disciplinary approach to understanding urban questions. Urban possibilities and challenges are analyzed by using a systems approach where ecological, social, and economic aspects are integrated through a social-ecological perspective to analyze resilience and sustainability. Linkages between and perspectives from science, social-sciences, and practice are emphasized throughout the course.
Prerequisite: ENST360.
Restriction: Must be a graduate student; or permission of AGNR-Environmental Science & Technology department.
Credit Only Granted for: ENST607 or ENST689C.
Formerly: ENST689C.

ENST608 Research Methods (1-4 Credits)
Development of research viewpoint by detailed study and report on crop and soil research of the Maryland Agriculture Experiment Station or review and discussion of literature on specific agricultural problems or new research techniques.
Restriction: Permission of AGNR-Environmental Science & Technology department.
Repeatable to: 4 credits if content differs.
Credit Only Granted for: ENST608 or NRSC608.
Formerly: NRSC608.

ENST611 Advanced Principles of Soil Fertility (3 Credits)
Soil factors affecting plant growth and quality with emphasis on the bio-availability of mineral nutrients. The management of soil systems to enhance plant growth by means of crop rotations, microbial activities, and use of organic and inorganic amendments.
Prerequisite: ENST200; or students who have taken courses with comparable content may contact the department.
Jointly offered with: ENST411.
Credit Only Granted for: ENST411 or ENST611.

ENST622 Advanced Soil Microbial Ecology (3 Credits)
The interdisciplinary study of soil microorganisms and their interactions with the mineral matrix; resulting in processes such as nutrient cycling, decontamination, and natural product production. We will focus on the diversity of soil communities, their survival strategies, and the new strategies used to study these communities.The course will include an examination of current literature in this field.
Prerequisite: ENST200; or 1 course in BCHM; or must have completed one course in microbiology; or students who have taken courses with comparable content may contact the department. Jointly offered with ENS T422.
Credit Only Granted for: ENST422 or ENST622.

ENST630 Advanced Wetland Soils (3 Credits)
The soils of wetlands including hydrology, biogeochemistry, and pedogenesis, including a focused discussion of current literature. Federal and regional guidelines for wetland soils are covered with an emphasis on validating interpretations through field observations.
Prerequisite: ENST200.
Credit Only Granted for: ENST630, ENST430, or NRSC461.

ENST640 Advanced Crops, Soils, and Civilization (3 Credits)
Explore the rise, cycling, resilience, and decline of civilizations and apply learning to modern issues in the fields of sustainability, environmental ethics, natural resource management, and agriculture. Role and importance of crop and soil resources in the development of human civilization. History of crop and soil use and management as they relate to the persistence of ancient and modern cultures.
Jointly offered with: ENST440.
Credit Only Granted for: ENST440 or ENST6 40.

ENST643 Advanced Industrial Ecology (3 Credits)
Problems of waste management and recycling in human societies are covered. The industrial ecology approach to design is contrasted with analogous patterns and processes from natural ecosystems.
Prerequisite: BSCI361; and permission of AGNR-Environmental Science & Technology department.
Jointly offered with: ENST443.
Credit Only Granted for: ENST443 or ENST643.

ENST645 Water and Development: A Global Challenge (3 Credits)
Broad study of water systems by integrating elements of environmental sciences, engineering, and policy analysis. Explore several real-world case studies, focusing on practical approaches for developing and managing water resources and derivative services. Review advanced methodologies for quantitative and qualitative policy analysis. Design management policies pertaining to complex water systems.
Prerequisite: MATH120, MATH220 or MATH140 (students who have taken courses with comparable content may contact the faculty).
Credit Only Granted for: ENST689P or ENST645.
Formerly: ENST689P.

ENST650 Advanced Wetland Ecology (3 Credits)
Plant and animal communities, biogeochemistry, and ecosystem properties of wetlands. Lectures are supplemented by field trips (normally 2 days total during the semester) and in-class labs. Hands-on activities and exercises include identification of wetland plant species, wetland mapping and delineation, and collection and analysis of field data on wetland vegetation, soil, and hydrology. Wading boots (at least hip length) are strongly recommended.
Prerequisite: BIOM301; and ENST360 or other ecology equivalent; or permission of AGNR-Environmental Science and Technology department; or permission of CMNS-Marine & Estuarine-Environmental Science Program).
Cross-listed with: MEES650.
Jointly offered with: ENST450, MEES650.
Credit Only Granted for: ENST450, ENST650, or MEES650.
Additional Information: Wading boots (at least hip length) are strongly recommended.

ENST681 Advanced Ecological Design (3 Credits)
An advanced survey course on the field of ecological design. Principles of design are illustrated with case studies from biologically-based waste treatment systems, ecosystem management and sustainable development.
Prerequisite: Must have completed one semester of calculus; and (CHEM131 and PHYS121). Or permission of instructor. Cross-listed with M EES681.
Credit Only Granted for: ENST481, ENST681, or MEES681.

ENST689 Special Topics (1-3 Credits)
Credit according to time scheduled and organization of the course. Organized as a lecture series on a specialized advanced topic.
Repeatable to: 6 credits if content differs.
Credit Only Granted for: ENST689 or NRSC689.
Formerly: NRSC689.

ENST702 Environmental Science and Technology: Communication and Professional Development (2 Credits)
Training in communication and professional development to prepare students to succeed in careers within the fields of environmental science and technology. Topics will include manuscript and technical writing, job search, communication with academic and non-academic audiences, multi-disciplinary collaboration, management (project, personnel, time), professionalism, leadership, ethics, and career opportunities. Course emphasizes practical training through facilitated discussions and critique practicums.
Prerequisite: ENST602.
Restriction: Must be in Environmental Science and Technology (Master's) program; or must be in Environmental Science and Technology (Doctoral) program; or permission of instructor.

ENST761 Methods in Pedological Investigations (4 Credits)
This is designed to equip students with analytical tools for soil microfabric and mineralogical analysis in order to understand soil properties and processes. A number of techniques will be discussed, but emphasis will be placed on micromorphology and x-ray diffractometry. Both theoretical and applied considerations will be convered, and students will gain substantial hands on experience in collecting and interpreting data germane to their research interests.
Prerequisite: ENST414; or permission of AGNR-Environmental Science & Technology department.

ENST789 Advances in Research (1-4 Credits)
A study of recent advances in agronomy research.
Repeatable to: 4 credits if content differs.
Credit Only Granted for: ENST789 or NRSC789.
Formerly: NRSC789.

ENST798 Graduate Seminar (1 Credit)
Designed to provide a venue for interactive discussion between ENST graduate students and other members of the ENST community regarding thesis/dissertation research planned or conducted as part of the students graduate program.
Restriction: Must be in one of the following programs (Environmental Science and Technology (Doctoral); Environmental Science and Technology (Master's)) ; or permission of AGNR-Environmental Science & Technology department.
Repeatable to: 6 credits.
Credit Only Granted for: ENST798 or NRSC798.

ENST799 Master's Thesis Research (1-6 Credits)

ENST821 Advanced Methods of Soil Investigation (3 Credits)
First semester, alternate years. An advanced study of the theory of the chemical methods of soil investigation with emphasis on problems involving application of physical chemistry.
Credit Only Granted for: ENST821 or NRSC821.
Formerly: NRSC821.

ENST831 Soil Mineralogy (4 Credits)
Soil minerals, with emphasis on clay minerals, are studied from the viewpoint of soil genesis and physical chemistry. Mineralogical analyses by x-ray and chemical techniques.

ENST832 Advanced Soil Physics (3 Credits)
An advanced study of physical properties of soils.
Restriction: Permission of instructor; and permission of AGNR-Environmental Science & Technology department.
Credit Only Granted for: ENST832 or NRSC832.
Formerly: NRSC832.

ENST898 Pre-Candidacy Research (1-8 Credits)

ENST899 Doctoral Dissertation Research (1-8 Credits)

ENTM - Entomology

ENTM612 Insect Ecology (3 Credits)
An advanced course in plant-insect interactions, population and community ecology, insect biogeography and macroevolution, and their applications. Emphasis on primary literature, both foundational and contemporary.
Prerequisite: Permission of CMNS-Entomology department; or must have completed a course in general ecology.

ENTM667 Aquatic Entomology (3 Credits)
Biology, ecology, and taxonomy of aquatic insects in lotic and lentic habitats, their adaptation to aquatic life, their function in aquatic ecosystems, and their relationship to environmental deterioration.
Credit Only Granted for: ENTM667 or ENTM767.

ENTM699 Advanced Entomology (1-6 Credits)
Credit and prerequisites to be determined by the department. First and second semesters. Studies of minor problems in morphology, physiology, taxonomy and applied entomology, with particular reference to the preparation of the student for individual research.

ENTM701 Teaching & Professional Development in Biology (1 Credit)
Provides graduate students in the biological sciences with the foundational knowledge to become better teaching assistants and gives them an introduction into the skills and tools that they need to develop as professional scientists and educators.
Cross-listed with: BISI701.
Credit Only Granted for: ENTM701, BISI688Z, CBMG688Z, or BIOL701.
Formerly: BISI688Z, CBMG688Z, BIOL701.
Additional Information: Priority enrollment will be given to students in the BISI Graduate Program.

ENTM710 Insect Biodiversity, Physiology and Ecology (3 Credits)
Surveys the remarkable diversity of insects and their key roles in ecological systems. Major topics include insect systematics, anatomy, physiology, ecology, and evolution, considered from both empirical and theoretical perspectives, as well as applications in agriculture, human health, and conservation biology.

ENTM720 Native, Invasive, and Exotic Species (3 Credits)
This course will examine introduced species impact, how invasive and exotic species spread, their impact of native species and methods of invasive species control.

ENTM725 IPM Practices (3 Credits)
Introduction to the techniques of integrated pest management for proper pest control management. Integrated Pest Management (IPM) has been the most successful management paradigm for agriculture, forestry, and urban pest management for more than five decades. Students will learn the fundamental elements of IPM programs including recognition and monitoring of key pests, formation of decision-making guidelines, intervention tactics, and fundamentals of assessment.

ENTM730 Plant Diagnostics (3 Credits)
The first step to managing pest and disease problems in plants is an accurate diagnosis. In this course, students will learn about the various biotic (living) and abiotic (nonliving) factors that can contribute to plant problems, and how to evaluate evidence and distinguish between these factors to arrive at an accurate diagnosis.

ENTM735 Sustainability (3 Credits)
Application of the concept of sustainability to both ecosystem services provided by beneficial insects, as well as the management of injurious insects. Ecological functions of insects in the natural and anthropogenic landscape will be illustrated and discussed. In addition, case histories and discussions will focus on themes of sustainability in successful IPM programs, as well as specific practices that lead to sustainable agriculture. The course will conclude with the development of a list of sustainable practices for conserving and managing insects in the landscape.

ENTM740 Organic Practices (3 Credits)
Alternatives to chemical pesticides, what being certified organic entails and how these practices relate to ecological principles. This course will discuss various natural processes that occur in the farm setting to determine the best practices to maintain biodiversity and successful crop production.

ENTM745 Bee Biology and Beekeeping (3 Credits)
Students will be introduced to the anatomy and physiology of the honey bee colony with emphasis on how to use this information to best manage honey bee colonies.

ENTM746 Commercial Beekeeping (3 Credits)
An overview of the various components of the commercial beekeeping industry including migratory pollinators, queen rearing operations and honey producers will be explored.

ENTM747 Pollinator Health (3 Credits)
Students will be given an overview of the importance of insect pollinators and threats to their populations. Emphasis will be placed on managed pollinators, particularly but not exclusively honey bees, where disease mitigation plans will be highlighted.

ENTM751 The History and Culture of Bees and Beekeepers (3 Credits)
An exploration of the history of beekeeping in culture and literature. A comparison of past and present beekeeping practices in different regions of the world will be highlighted.

ENTM756 Insect Diseases and Pathology (3 Credits)
Integrates aspects of biochemistry, molecular biology and evolution theory with ecology using pathogens of insects as a model. The various biotic (living) and abiotic (nonliving) factors that can contribute to plant problems. Explores the direction and goals of innovation in microbial biocontrol as well as the effect of social criticism and considerations of environmental impact on attempts to introduce engineered microorganisms.
Credit Only Granted for: ENTM715 or ENTM756.
Formerly: ENTM715.

ENTM760 Insects in the 21st Century (3 Credits)
This course will explore the influence and impact of major technological advances in genetics, molecular genetics and biotechnology on the study of insects. Topics will include the use of insects as models for studying human biology and diseases; the use of genetics and genetic technologies to augment existing strategies for managing pest insects and well as the invention of novel management approaches; the use of genetics and genetic technologies in the fields of insect conservation, ecology and evolution.

ENTM767 Ecology of Aquatic Insects (3 Credits)
Designed for graduate students and advanced undergraduates with interests in aquatic ecology and the identification of insects inhabiting lentic (e.g., lakes, ponds, wetlands) and lotic (e.g., rivers, streams, creeks) habitats. Because of the widespread occurrence of aquatic species within the hexapods, insects have invaded freshwater habitats many times during their evolution, in some cases multiple times within an order of insects. This evolution has resulted in a diversity of morphological and physiological adaptations. The course will emphasize the biology, ecology, and identification of aquatic insects (and other hexapods), as well as applied aspects of biological monitoring and pest management.
Credit Only Granted for: ENTM667 or ENTM767.

ENTM769 Capstone: Scholarly Paper (3 Credits)
An examination of the current literature on topics related to the field of applied entomology. The Capstone Course provides the opportunity to apply and integrate best practices based on current research in the form of a formal scholarly paper.

ENTM788 Entomological Topics (1-3 Credits)
One lecture or one two-hour laboratory period a week for each credit hour. Lectures, group discussions or laboratory sessions on selected topics such as: aquatic insects, biological control of insects, entomological literature, forest entomology, history of entomology, insect biochemistry, insect embryology, immature insects, insect behavior, insect communication, principles of entomological research.
Prerequisite: Permission of CMNS-Entomology department.

ENTM789 Field Experience in Pest Management (1-6 Credits)
Involvement in practical problems of pest management in field situations. The student will be assigned to a problem area for intensive experience, usually during the summer. A final written report is required for each assignment.
Repeatable to: 6 credits.

ENTM798 Topic Seminar (1 Credit)
Discussion and presentation of current research and literature.
Prerequisite: Permission of CMNS-Entomology department.

ENTM799 Master's Thesis Research (1-6 Credits)

ENTM898 Pre-Candidacy Research (1-8 Credits)

ENTM899 Doctoral Dissertation Research (1-8 Credits)

ENTS - Telecommunications

ENTS609 Telecommunications Project (3 Credits)
Consists of a student project in the area of telecommunication system applications, management, or policy. Specific projects will be supervised individually by faculty members associated with the M.S Program in Telecommunications.

ENTS622 Introduction to Digital Communication Systems (3 Credits)
Principles of analog and digital communication systems design. Analysis of the performance and relative merits of different modulation and demodulation, signal processing, filtering and error control schemes in communication systems. Also provides an understanding of the design of modern digital communication systems.
Restriction: Must be in Telecommunications (Master's) program; or permission of ENGR-Electrical & Computer Engineering department.
Credit Only Granted for: ENTS622 or ENTS689B.
Formerly: ENTS689B.

ENTS625 Management and Organizational Behavior in the Telecommunications Industry (3 Credits)
Roles of the general manager in: determining target markets and designing strategies for them; formulating and implementing corporate and business level strategies; and staffing, developing, and managing human resources and coordinating them with the organization's financial and physical resources. Also emphasizes the building of interpersonal skills with respect to the selection of members for work teams and team formation, leadership of teams toward the achievement of strategic goals and total quality, the development and motivation of team members, and the evaluation of team and individual performance.

ENTS629 Special Topics in Cybersecurity (3 Credits)
Selected topics of current importance in cybersecurity.
Restriction: Must be in Telecommunications (Master's) program.
Repeatable to: 18 credits if content differs.

ENTS630 The Economics of International Telecommunications (3 Credits)
Basic microeconomic principles used by telecommunications firms, including supply and demand, elasticity, costs, productivity, pricing, market structure and competitive implications of alternative market structures. Market failures and government intervention. Public policy processes affecting business operations.
Restriction: Must be in Telecommunications (Master's) program.

ENTS632 Telecommunications Marketing Management (3 Credits)
Topics covered include strategic marketing, sales and customer service challenges confronting organizations in the computer, communications and media industries. The course also addresses volatile technology, regulatory and competitive environments as a backdrop to strategic planning and management in the marketing domain.
Restriction: Must be in Telecommunications (Master's) program.

ENTS635 Decision Support Methods for Telecommunication Managers (3 Credits)
The aim of this course is to introduce management science techniques for informed decision making. Topics covered can include data analysis and regression, optimization models and applications (workforce scheduling, manufacturing, network design, facility location), sensitivity analysis, decision trees, risk analysis and business simulation models. Emphasis will be on telecommunications managerial problems, model development and the use of software packages for decision support.
Restriction: Must be in Telecommunications (Master's) program.

ENTS639 Special Topics in Business (3 Credits)
Selected topics of current importance in business.
Restriction: Must be in Telecommunications (Master's) program.
Repeatable to: 18 credits if content differs.

ENTS640 Networks and Protocols I (3 Credits)
An overview of design issues and the important industry standards for digital communications networks. This includes protocols, data communications technologies, error correction and detection, congestion control, traffic routing, Local Area Network (LAN) protocols, TCP/IP, and some security issues.
Restriction: Must be in Telecommunications (Master's) program.

ENTS641 Networks and Protocols II (3 Credits)
Techniques for the specification, design, analysis, verification and testing of communication protocols are discussed. The course includes detailed discussion on routing protocols in the Internet. This includes Routing Information Protocol (RIP), Enchanced Interior Gateway Routing Protocol (EIGRP). Open Shortest Path First (OSPF), and Border Gateway Protocol (BGP4).
Prerequisite: ENTS640.
Restriction: Must be in Telecommunications (Master's) program.

ENTS649 Special Topics in Networking (3 Credits)
Selected topics of current importance in networking.
Restriction: Must be in Telecommunications (Master's) program.

ENTS653 AWS/PCS System Implementation (3 Credits)
Engineering issues associated with designing and deploying a AWS/PCS cellular wireless communications system in the current world environment will be examined. The course will focus on implementation issues such as the impact of real world concerns on the deployment strategy and the use of good engineering practice to overcome obstacles. Students will create and modify mock deployments using professional tools for cell planning and interference analysis. Students will also be exposed to drive testing tools and concepts for migration to future technologies.
Restriction: Must be in Telecommunications (Master's) program.

ENTS654 Optimization and Analysis of GSM Networks (3 Credits)
The techniques needed to successfully optimize a functioning GSM networkwill be examined. Students will conduct extensive drive tests of a working network in the Washington DC area using state-of-the-art drive test equipment and will analyze the recorded data with post-processing analysis tools. Also, they will learn to recognize problems based on network behaviors and what courses of action are available to correct them. Lab work and data collection will constitute a majority of the class work.
Prerequisite: ENTS656 or ENTS653; and permission of ENGR-Electrical & Computer Engineering department.
Restriction: Must be in Telecommunications (Master's) program.
Credit Only Granted for: ENTS654 or ENTS689B.

ENTS656 Introduction to Cellular Communication Networks (3 Credits)
Concepts and techniques involved in wireless digital communications with emphasis on cellular and PCS systems. Properties of Mobile radio channels; intersymbol interference, multipath, and fading effects; interleaving and diversity; multiple access schemes (TDMA, FDMA, CDMA); interuser interference, traffic issues, and cell capacity; power control strategies; frequency reuse and channel assignment; handoff, paging, and location update; cell layout; introduction to cellular and PCS standards.

ENTS657 Satellite Communication Systems (3 Credits)
An examination of satellite telecommunication systems with an emphasis on the mobile satellite systems (MSS). Topics will include a historical perspective, orbital mechanics and constellations, choice of orbital parameters, propagations considerations, link budgets, interference issues and other obstacles, and existing and proposed mobile satellite systems. It will also look at some of the business aspects such as the cost of deploying and maintaining these systems.
Credit Only Granted for: ENTS657 or ENTS689S.
Formerly: ENTS689S.

ENTS659 Special Topics in Communications (3 Credits)
Selected topics of current importance in communications.
Restriction: Must be in Telecommunications (Master's) program.

ENTS669 Special Topics in Computing (3 Credits)
Selected topics of current importance in computing.
Restriction: Must be in Telecommunications (Master's) program.
Repeatable to: 18 credits.

ENTS670 Introduction to Business and Enterpreneurship (3 Credits)
This is a fundamental course that provides a broad introduction to various business issues faced by any small business or starup. Course instructors present the key issues involved in outlining a clear value proposition and profitable business model, managing and monitoring finances, developing a winning team, addressing legal considerations, executing on operations including marketing sales, manufacturing and service.
Restriction: Must be in Telecommunications (Master's) program.
Credit Only Granted for: ENTS670 or ENTS689J.

ENTS673 Project Management for Telecommunications (3 Credits)
Introduces modiern project management. Begins with an overview and expands into Adaptive and Extreme project management. The focus then shifts to the individual skills required to be an effective project manager, such as time management, leadership and motivation. Once skills of the individual have been addressed, social networks and how they impact project management are examined.
Formerly: ENTS689P.

ENTS689 Special Topics in Telecommunications (3 Credits)
Selected topics of current importance in telecommunications.
Restriction: Must be in Telecommunications (Master's) program.
Repeatable to: 18 credits if content differs.

ENTS699 Independent Study in Telecommunications (1-3 Credits)
Individual instruction course. See ENTS program office for section number.
Repeatable to: 3 credits if content differs.

ENTS749 Advanced Topics in Networking (3 Credits)
Selected advanced topics in networking.
Prerequisite: ENTS640 or ENTS641; or permission of instructor.
Restriction: Must be in Telecommunications (Master's) program.
Repeatable to: 18 credits if content differs.

ENTS759 Advanced Topics in Communications (3 Credits)
Selected advanced topics in communications.
Prerequisite: ENTS622; or students who have taken courses with comparable content may contact the department. And (ENTS656 or ENTS653).
Restriction: Must be in Telecommunications (Master's) program.
Repeatable to: 18 credits if content differs.

EPIB - Epidemiology and Biostatistics

EPIB463 Introduction to Programming in R (3 Credits)
An introduction to basic programming in R; including principles, data analysis tasks such as the calculation of summary statistics and the creation of graphs; and the implementation of statistical analysis concepts such as T-tests, ANOVA and correlation.
Prerequisite: EPIB315.
Jointly offered with: EPIB695.
Credit Only Granted for: EPIB463 or EPIB695.

EPIB489 Special Topics in Epidemiology or Biostatistics (1-6 Credits)
Special topics in epidemiology or biostatistics.
Repeatable to: 6 credits if content differs.

EPIB610 Foundations of Epidemiology (3 Credits)
Introduction to the discipline of epidemiology and its applications to health issues and practices. Basic epidemiologic concepts and methods will be covered.
Prerequisite: EPIB300; or equivalent undergraduate statistics or biostatistics course with a grade of C- or higher; or a score of 70% or higher on EPIB300 placement exam.
Credit Only Granted for: EPIB610 or HLTH720.
Formerly: HLTH720.

EPIB611 Intermediate Epidemiology (3 Credits)
Analysis of epidemiologic methods as applied to epidemiologic research, analysis of bias, confounding, effect modification issues, overview of design, implementation, and analysis of epidemiologic studies.
Prerequisite: 1 course with a minimum grade of B- from (SPHL602, EPIB610); or a minimum score of 70% on the SPHL602 or EPIB610 waiver exam.

EPIB612 Epidemiologic Study Design (3 Credits)
Application of epidemiologic study designs, analytic methods used for analysis of cohort, case-control, cross-sectional, and clinical trials research.
Prerequisite: EPIB611.

EPIB620 Chronic Disease Epidemiology (3 Credits)
Overview of prevalence and risk factors for major chronic diseases. Discussion of methodological issues unique to specific chronic disease.
Prerequisite: Must have completed or be concurrently enrolled in SPHL602; or EPIB610.

EPIB621 Infectious Disease Epidemiology (3 Credits)
Overview of the unique aspects of infectious diseases and the epidemiological methods used in their study, prevention, and control.
Prerequisite: Must have completed or be concurrently enrolled in SPHL602; or EPIB610.

EPIB622 Social Determinants of Health (3 Credits)
Overview of the major social variables that affect public health, including socioeconomic status, poverty, income distribution, race, social networks/support, community cohesion, psychological stress, gender, and work and neighborhood environment.
Prerequisite: Must have completed or be concurrently enrolled in SPHL602; or EPIB610.

EPIB623 Epidemiologic Methods in Health Disparities Research (3 Credits)
An examination of the measurement, monitoring, analysis, and reporting of health disparities in the U.S. Through in-depth examples and class activities, students will learn about the state of health disparities, epidemiologic methods for health disparity assessments, and best practices for translating data on health disparities for policy makers.
Prerequisite: Must have completed or be concurrently enrolled in SPHL602; or EPIB610.

EPIB624 Genetic in Public Health (3 Credits)
Emerging role of genetics in public health; overview of basic tenets of human genetics; examination of how public health practices and research are influenced by genetics and ethical issues specific to genetics.
Prerequisite: EPIB610.

EPIB626 Epidemiology of Obesity (3 Credits)
Overview of the epidemiological, prevention, and treatment of obesity, its causes and consequences, and energy balance issues; application of epidemiologic methods to the study of obesity epidemiology.
Prerequisite: Must have completed or be concurrently enrolled in SPHL602; or EPIB610.

EPIB627 Epidemiologic Methods for Primary Research (3 Credits)
Students are provided with the knowledge and skills needed to design and implement epidemiological research studies and to collect primary data. Presents an overview of types of research designs, sampling methodologies, measurement issues, questionnaire design, and guidelines for recruiting and interacting with participants. This foundation of knowledge is applied to group assignments, which apply the steps involved in the primary data collection process. Goals include: (a) achieving competence in designing and implementing studies based on scientifically sound epidemiological research methods; and (b) gaining the ability to critically evaluate health research and epidemiological studies.
Prerequisite: EPIB610; or permission of instructor.
Credit Only Granted for: EPIB600 or EPIB627.
Formerly: EPIB660.

EPIB630 Epidemiologic Methods in Sexual and Reproductive Health Research (3 Credits)
Examination of epidemiologic methods (quantitative and qualitative) for collecting and analyzing data on sexual and reproductive health. The emphasis will be to introduce students to the appropriate methods used for challenging and sensitive research topics such as sexual behavior, HIV/STI, drug use, sexual abuse.
Prerequisite: Must have completed or be concurrently enrolled in SPHL602; or EPIB610.

EPIB633 Health Survey Design and Analysis (3 Credits)
An overview of types of survey research designs, questionnaire design, measurement issues, and techniques for recruiting and interacting with participants. Students will discuss and implement a variety of health survey analysis techniques, including how to utilize SAS statistical software to estimate descriptive statistics and implement regression models, while accounting for complex survey designs.
Prerequisite: SPHL602 or EPIB610; or permission of Instructor.
Recommended: EPIB697.

EPIB634 Applied Data Analysis in Social Epidemiology and Behavioral Health (3 Credits)
Focuses on the application of factor analysis, mediation analysis using path analytic model, and structural equation model in social epidemiology and behavioral health. Application of these analytical methods using SAS.
Prerequisite: EPIB610 and EPIB650; or permission of instructor.

EPIB635 Applied Multilevel Modeling in Health Research (3 Credits)
Multilevel modeling is a popular analytic technique in health research that collects data from participants at hierarchic levels, e.g., residents nested in neighborhoods, and patients in hospitals. The course covers topics in multilevel modeling including two- and three-level multilevel linear modeling, logistic regression model, modeling with ordered and nominal outcomes, as well as strategies for model building. This course focuses on the application of multilevel modeling, rather than mathematics. The instructor uses a step-by-step approach to teach this course with real-world examples. The course begins with an overview of the feature of multilevel data then transitions to the analytic foundations of multilevel models. Later lectures cover the use of multilevel modeling to predict the occurrence of an outcome (prediction model) and estimate the exposure-outcome association by controlling potential confounding and assessing interactions (association model).
Prerequisite: Working knowledge of fundamental statistical concepts, regression modeling, and SAS programming.

EPIB637 Social Epidemiologic Methods in Health Equity Research (3 Credits)
Provides students with the knowledge and skills to design and implement social epidemiology studies related to investigating health inequities. Presents an overview of drivers of health inequities (e.g., racism, socioeconomic status) and conceptual and methodological challenges in empirically investigating these social determinants of health including issues related to confounding, selection bias, measurement error, and evaluation of mechanisms. Covers methodological approaches that can be used to address these challenges including instrumental variable analyses, difference-in-differences, mediation analyses using inverse odds ratio weighting, and qualitative analyses. This knowledge will be applied to exploring research questions of your choice. The course will foster a co-learning environment and recognize the value and strength of interdisciplinary perspectives. Curiosity and critical thinking are encouraged and supported.
Prerequisite: Minimum grade of B- in SPHL602 or EPIB610; or permission of instructor.

EPIB642 Obesity Epidemiology: Hormones and Cancer (3 Credits)
An overview of the epidemiology, prevention and treatment of obesity with a focus on associations with cancer and hormonal mechanisms. This course will integrate public health disciplines including epidemiological methods, molecular biology, behavior and clinical science to discuss the causes and consequences of obesity, particularly cancer.
Prerequisite: SPHL602 or EPIB610; or equivalent .
Restriction: Must be in an SPHL program; or must have permission of the instructor.

EPIB643 Lifecourse Epidemiology: Methods, Pathways, and Applications for Healthier Lives (3 Credits)
Through lectures, readings, class exercises and discussion, this class provides a critical survey of Lifecourse epidemiology and its application to the public's health. In this class we will systematically survey both seminal and current literature on lifecourse epidemiology along with key related topics ranging from cellular to societal function. We consider the debates and controversies that ensued following publication of many of the groundbreaking papers and the subsequent revisions and evolution of the field in the context of these controversies. The second half of the class surveys the current state of science of Lifecourse epidemiology. We conclude this course by focusing on the growing literature on paternal influences within the Lifecourse perspective as well as opportunities for promoting health over the generations.
Prerequisite: Minimum grade of B- in SPHL602 or EPIB610; or equivalent.
Restriction: Must be in a program within the Department of Epidemiology and Biostatistics; or must have permission from the Department of Epidemiology and Biostatistics.

EPIB650 Biostatistics I (3 Credits)
Basic statistical concepts and procedures for Public Health. Focuses on applications, hands-on-experience, and interpretations of statistical findings.
Prerequisite: EPIB300; or equivalent undergraduate statistics or biostatistics course with a grade of C- or higher; or a score of 70% or higher on EPIB placement exam.
Credit Only Granted for: EPIB650, HLTH651, or HLTH688B.
Formerly: HLTH651 and HLTH688B.

EPIB651 Applied Regression Analysis (3 Credits)
An introduction to important statistical methods used in public health research, including nonparametric hypothesis testing, ANOVA, simple and multiple linear regression, logistic regression, and categorical data analysis.
Prerequisite: Minimum grade of B- in EPIB650.
Recommended: EPIB697 or previous experience working with SAS is highly recommended.

EPIB652 Categorical Data Analysis (3 Credits)
Methods for analysis of categorical data as applied to public health research, including contingency tables, logistic regression, multicategory logic models, loglinear models, and models for matched-pairs.
Prerequisite: EPIB651.
Recommended: EPIB697 or previous experience working with SAS is highly recommended.

EPIB653 Applied Survival Data Analysis (3 Credits)
Overview of statistical methods for anlayzing censored survival data, including the Kaplan-Meier estimator, the log-rank test, Cox PH model.
Prerequisite: EPIB651.

EPIB654 Clinical Trials: Design and Analysis (3 Credits)
This course provides an introduction to the clinical trials design and data analysis. Topics covered include: history/background and process for clinical trial, key concepts for good statistics practice (GSP)/good clinical practice (GCP), regulatory requirement for pharmaceutical/clinical development, basic considerations for clinical trials, designs for clinical trials, classification of clinical trials, power analysis for sample size calculation for different designs, statistical analysis for efficacy evaluation, statistical analysis for safety assessment, implementation of a clinical protocol, statistical analysis plan, data safety monitoring, adaptive design methods in clinical trials (general concepts, group sequential design, dose finding design, and phase I/II or phase II/III design) and controversial issues in clinical trials.
Prerequisite: EPIB650 or SPHL602, and EPIB651; or permission of instructor.

EPIB655 Longitudinal Data Analysis (3 Credits)
Statistical models for drawing scientific inferences from longitudinal data, longitudinal study design, repeated measures and random effects to account for experimental designs that involve correlated responses, handling of missing data.
Prerequisite: EPIB651.

EPIB656 Applied Bayesian Data Analysis (3 Credits)
The theory and practical application of Bayesian statistical methods in the field of public health and related areas. A variety of models will be discussed including linear regression, multilevel model, generalized linear model, generalized linear mixed model.
Prerequisite: EPIB652 or STAT700; or permission of instructor.

EPIB657 Spatial Statistics for Public Health Data (3 Credits)
Overview three main areas of spatial statistics: point patterns, geostatistical data, and lattice (areal) data. Application of spatial statistical models including CSR, k-function, krigging, semivariogram, CAR, SAR, GWR, spatial GLM, and multilevel model to public health and environmental data analysis.
Prerequisite: EPIB651 and EPIB652; or permission of instructor.

EPIB660 Analysis of National Health Survey Data (3 Credits)
Provides background on how features such as stratification, clustering, and unequal sample selection probabilities can invalidate the assumptions underlying traditional statistical techniques, those implicitly assuming a simple random sampling with replacement design. Application using the SURVEY family of SAS/STAT procedures (Version 9.4 or later).
Prerequisite: EPIB650; or permission from Instructor.
Recommended: EPIB697.

EPIB661 Applied Multivariate Data Analysis (3 Credits)
Multivariate analysis targets data with simultaneous measurements on many variables and studies the relationship between these variables. This course introduces important multivariate analysis methods used in public health research. Topics include multivariate regression analysis, multivariate analysis of variance (MANOVA), principal component analysis (PCA), factor analysis, discriminant analysis (classification), clustering analysis, canonical correlation analysis (CCA) and correspondence analysis (CA).
Prerequisite: Must have completed EPIB651 or permission of instructor.
Recommended: Previous experience with at least one statistical software package (e.g. SAS, R, STATA). SAS is the main software package used for demonstration in class.

EPIB663 SAS Programming (3 Credits)
Learn how to analyze and summarize data using SAS. The course begins by introducing the students to basic SAS programming and data manipulation techniques. More advanced themes, such as preliminary data analysis and graphs, are explored later in the semester. Finally, the class covers the implementation of several advanced statistical concepts in SAS, including T-tests, ANOVA, non-parametric tests, regression and normality tests.
Credit Only Granted for: EPIP698E or EPIB663.
Formerly: EPIB698E.

EPIB664 Missing Data Analysis (3 Credits)
Missing data is a common problem in almost all scientific fields. Students will learn the different patterns and mechanisms of missing data, common procedures to handle missingness including weighting procedure, imputation-based procedure and model-based procedure. Useful and popular imputation methods and tools will be introduced. Numerous real data examples will be included to help students understand and solve the real world problem with missing data for different study designs.
Recommended: Previous experience with at least one statistical software (e.g. SAS, R, STATA).

EPIB670 Molecular Epidemiology of Infectious Diseases (2 Credits)
Molecular epidemiology is a discipline that uses molecular microbiology tools to study the distribution and determinants of diseases in human and animal populations. This course will provide a comprehensive overview and detailed discussion of the core molecular approaches and recent technological advances that are and can be used to investigate the etiology, transmission, and control of infectious diseases in veterinary medicine and public health. Theoretical and practical aspects of various molecular biology methods will be discussed in the context of epidemiological studies of infectious diseases including both bacterial and viral infections of veterinary and zoonotic significance. Lecture topics will cover the principles and application of various molecular techniques to problems of infectious diseases; population and evolutionary genetics of pathogenic microorganisms; data analysis and interpretation. Lecture materials will also be supported with practical data analysis, literature review discussions, which will be student-driven that will critique relevant manuscripts via group discussions in the classroom.
Prerequisite: Students planning to take this course are expected to have had some backgrounds in infectious diseases and molecular biology.
Cross-listed with: VMSC670.

EPIB672 Public Health Informatics (3 Credits)
A basic overview of Informatics and its application in a public health setting. The major goal is for students to understand the basic tools and building blocks needed to utilize this technology in order to improve their professional productivity
Cross-listed with: HLTH672.
Restriction: Instructor permission is required for students not enrolled in a degree seeking program in the School of Public Health.
Credit Only Granted for: HLTH670 or HLTH672 or EPIB672.
Formerly: HLTH670.

EPIB674 Statistical Foundations of Machine Learning in Public Health: From Classical to Deep Learning (3 Credits)
This graduate-level course in machine learning focuses on modern techniques for analyzing complex and massive data sets. Emphasis is placed on applications, computational methods, and the theoretical foundations of machine learning.
Prerequisite: EPIB650 and EPIB651 or equivalent. This requirement can be met through other relevant courses or experience, with the consent of the instructor.
Additional Information: Familiarity with R and some experience with Python is expected.

EPIB684 Epidemiologic Research Using Electronic Health Records Data (3 Credits)
Teaches students how to use health data, like electronic health records (EHR), hospital discharge records, and administrative claims (e.g., Medicare), for epidemiologic studies. Students will gain an understanding of how health data are generated through healthcare utilization and claims for reimbursement sent to payors from physicians, hospitals, and pharmacies. Students will also learn about coding nomenclature, including ICD-10-CM diagnosis codes, ICD-10-CM and CPT procedure codes, and medication coding systems. Students will be given access to a sample of health data to learn how to identify patient populations, identify comorbidities and other measures of health and healthcare utilization, and conduct studies on healthcare utilization and outcomes. Students will also learn about current hot topics in health data, including common data models, how social determinants of health can impact health data and introduce bias, risk prediction and AI, and data linkage.
Prerequisite: A minimum grade of B- in EPIB610; or equivalent; and a minimum grade of B- in EPIB697; or previous programming experience in SAS through other courses and/or activities with permission from the instructor.

EPIB685 Causal Inference in Epidemiology (3 Credits)
Public health and epidemiologic research are largely focused on asking causal questions (e.g., "Does X cause disease Y?"); however, most observational studies do not have appropriate study designs and analytic approaches to generate causal conclusions. This course will introduce students to causal inference fundamentals and methodology, with a focus on how to generate and analyze data to make causal inferences. This course will review the differences between association and causation, how to develop causal research questions, the underlying assumptions needed for causal inference, and how to design and analyze studies with causal questions. Applied examples and hands-on exercises will be used throughout the course to help students master the concepts.
Prerequisite: Minimum grade of B- in EPIB611 or equivalent; and minimum grade of B- in EPIB651 or equivalent; or permission from instructor.
Recommended: EPIB612 or equivalent and previous programming experience through coursework (e.g., EPIB695, EPIB697) or other activities.

EPIB689 Advanced Topics in Epidemiology or Biostatistics (1-6 Credits)
Special topics in epidemiology or biostatistics.
Repeatable to: 6 credits if content differs.

EPIB695 Introduction to R for Health Data Analysis (3 Credits)
A hands-on introduction to the statistical package R for health data management and analysis. The first part of the course focuses on basic and essential data manipulation and visualization using R. The second part emphasizes the use of R in statistical analyses, including summarization, correlation, chi-squared test, t-tests, ANOVA, simple and multiple regression. Students will also learn fundamental R language programming to perform user-defined calculations. No previous knowledge of R or of statistical analysis are assumed.
Jointly offered with: EPIB463.
Credit Only Granted for: EPIB463 or EPIB695.

EPIB697 Public Health Data Management (3 Credits)
This course is designed to provide students with the expertise needed to effectively manage research data using SAS as the statistical programming language.
Restriction: Must be in a program within the Maryland School of Public Health .

EPIB698 Special Topics in Epidemiology and Biostatistics (1-3 Credits)
Open to master or doctoral students who desire to pursue special topics in Epidemiology and Biostatistics.

EPIB710 Grantsmanship for Epidemiologic Research (3 Credits)
In-depth study of the knowledge and skills needed to design, conduct, and evaluate an epidemiologic research study. Development of a complete research project.
Prerequisite: EPIB650, EPIB610, EPIB612, EPIB651, and EPIB611.

EPIB740 Advanced Methods in Epidemiology (3 Credits)
In-depth investigation of epidemiologic methods for making causal inferences and solving complex methodological problems. Multivariate models emphasized.
Prerequisite: EPIB650, EPIB610, EPIB612, EPIB651, and EPIB611.

EPIB741 Association Models for Cohort and Cross-Sectional Studies (3 Credits)
The first part of a two-course advanced methods series specifically designed for doctoral students in epidemiology. This course focuses on implementing analytical strategies guided by epidemiologic principles for data analysis, with an emphasis on association modeling techniques tailored for cohort and cross-sectional studies. Key topics include model specification, effect estimation, confounding control, and the assessment of interaction and mediation effects. The course covers applied multivariate regression models, such as log-binomial regression, robust Poisson regression, the Cox proportional hazards models, and propensity-score models. Detailed procedures are provided for model specification, assessment of model assumptions, selection of alternative models, estimation of effects, and interpretation of findings from association models.
Prerequisite: EPIB612; or permission of instructor .

EPIB742 Association Models for Case-Control and Ecological Studies (3 Credits)
The second part of a two-course advanced methods series specifically designed for doctoral students in epidemiology. EPIB742 emphasizes the implementation of analytical strategies rooted in epidemiologic principles for data analysis. The course focuses on specific association modeling techniques for analyzing data from traditional, matched, and population-based case-control studies, case-crossover studies, and ecological studies. Key topics include model specification, effect estimation, control of confounding, and assessment of interaction effects. The curriculum covers applied multivariate regression models such as traditional logistic regression, conditional logistic regression, conditional Cox proportional hazards regression, and weighted Cox regression models. Additionally, the course introduces spline techniques for analyzing dose-response data. Detailed procedures for model specification, assessment of model assumptions, selection of alternative models, effect estimates, and interpretation of findings from association models are thoroughly explored.
Prerequisite: EPIB741.

EPIB778 Practical Experience in Public Health (1-3 Credits)
Practice experience providing an opportunity to apply previously acquired knowledge and skills in a health or allied health organization. Setting of the practice experience will depend upon the student's background and career goals.
Prerequisite: Permission of SPHL-Department of Epidemiology and Biostatistics.
Restriction: Must be enrolled in the Master of Public Health program in Biostatistics or Epidemiology.
Repeatable to: 3 credits.

EPIB786 Capstone Project in Public Health (3 Credits)
Capstone experience providing opportunity to apply knowledge and skills to a specific public health problem or issue. Completion of project relevant to public health under the direction of an advisor.
Prerequisite: Permission of SPHL-Epidemiology & Biostatistics department.
Restriction: Must be enrolled in the Master of Public Health program in Biostatistics or Epidemiology.

EPIB788 Critical Readings in Epidemiology and Biostatistics (1-3 Credits)
Open to doctoral students to discuss critical readings in Epidemiology and Biostatistics.
Prerequisite: Must have completed or be concurrently enrolled in EPIB610.
Restriction: Must be enrolled in the Epidemiology PhD program (EPID).
Repeatable to: 6 credits if content differs.

EPIB798 Independent Study (1-6 Credits)
Master or doctoral students who desire to pursue special research problems under the direction of a faculty memeber of the department may register for 1-6 hours of credit under this number.
Prerequisite: Permission of SPHL-Epidemiology & Biostatistics department.
Repeatable to: 9 credits if content differs.

EPIB799 Master's Thesis Research (1-6 Credits)

EPIB898 Pre-Candidacy Research (1-8 Credits)

EPIB899 Doctoral Dissertation Research (1-8 Credits)

FILM - Film Studies

FMSC - Family Science

FMSC420 African American Families (3 Credits)
Examination of the history, structure, cultural foundation, and diversity of African American family life is the focus of this class. Presentations and discussions enable students to identify, analyze, and assess: (1) the major theoretical perspectives used in the study of African American families; (2) the impact of social policy on African American families; and (3) specific areas of family life (e.g., marriage and divorce, parenting, child development, health disparities).
Recommended: FMSC330.
Credit Only Granted for: FMSC420 or FMSC498F.
Formerly: FMSC498F.

FMSC431 Family Crises, Emergencies and Interventions (3 Credits)
Examines the stressors in life that may lead families into a state of crisis or emergency and what can be done to help families when the need arises. Both internal stressors, such as substance abuse, finances, divorce, illness or parent-child conflict, and external stressors, such as community violence and natural disasters, are examined. Using theories and techniques for intervention and enhancement, the course examines factors involved in stressors turning into a family crisis and how factors such as emergency preparedness, social support and public policy can be a source of family resilience or protect families from negative outcomes.
Prerequisite: Minimum grade of C- in PSYC100, SOCY100, or SOCY105.

FMSC432 Adult Development and Aging in Families (3 Credits)
Theory, research, history, and programming related to adult development and aging in the intergenerational context of family.
Prerequisite: Minimum grade of C- in PSYC100.
Restriction: Must be in a major within SPHL-Family Science department.
Credit Only Granted for: FMSC432 or FMST432.
Formerly: FMST432.

FMSC440 Death and Loss in Family Life (3 Credits)
Examination of how families experience grief and loss resulting from the death of a family member, including health and financial consequences. Overview of historical, social, psychological, cultural, medical, and legal dimensions of death in families from diverse backgrounds. Exploration of how the health care system and funeral home industry assist families in managing death and loss.
Recommended: Moderate level of computer literacy, especially Internet and ELMS. Reliable computer and Internet access.
Credit Only Granted for: FMSC440 or FMSC498B.
Formerly: FMSC498B.

FMSC445 Sexuality: Issues in Family Therapy and Service Delivery (3 Credits)
Typical, dysfunctional, and pathological sexual functioning, including effects on individuals, couples, and family systems. Sensitizes students to sexual issues, explores how perceptions of such issues affect work with people, and emphasizes implications for marriage and family therapy.
Prerequisite: A basic course in human sexuality; and permission of instructor. Jointly offered with FMSC645.
Credit Only Granted for: FMSC445 or FMSC645.

FMSC460 Violence in Families (3 Credits)
Theories of child, spouse, and elder abuse in the family setting. Emphasis on historical, psychological, sociological and legal trends relating to physical, emotional, and sexual abuse. Introduction to methods for prevention and remediation.
Prerequisite: SOCY100, SOCY105, or PSYC100.
Credit Only Granted for: FMSC460 or FMST460.
Formerly: FMST460.

FMSC477 Internship and Analysis in Family Health (3 Credits)
A supervised internship and a seminar requiring analysis. Opportunities to integrate theory and practice including 120 hours of contracted field experience.
Prerequisite: FMSC383; and 9 credits in FMSC courses; and permission of SPHL-Family Science department.
Restriction: Must be in a major within SPHL-Family Science department.
Credit Only Granted for: FMSC477, FMST347, or FMST477.
Formerly: FMST477.
Additional Information: See department for application procedures.

FMSC485 Introduction to Family Therapy (3 Credits)
The fundamental theoretical concepts and clinical procedures of marital and family therapy including premarital and divorce therapy issues.
Prerequisite: FMSC330; or 1 course from PSYC300-499 course range.
Credit Only Granted for: FMSC485 or FMST485.
Formerly: FMST485.

FMSC486 Law, Public Health and the Cuban Family (4 Credits)
A short-term summer study abroad course that is a comparative law and public health course. Students travel to Havana, Cuba to compare family problems in a capitalist versus socialist society within the context of legal, public health, social, cultural and economic changes.
Recommended: FMSC487.
Jointly offered with: FMSC686.
Credit Only Granted for: FMSC486, FMSC686 or MIEH698B.
Additional Information: This is a study abroad course which will primarily occur in Cuba. Additionally, the course involves an online component prior to and following the trip.

FMSC487 Family Law (3 Credits)
Designed for students interested in studying the law, public health, and family science, this course provides students with a general overview of family law and the impact on healthy families. The course also includes the study of cutting-edge issues such as marriage equality, assisted reproduction and ethical issues that may arise.

FMSC498 Special Topics: Family Science (1-3 Credits)
Special course topics in family studies.
Prerequisite: Permission of SPHL-Family Science department.
Repeatable to: 6 credits if content differs.
Formerly: FMST498.

FMSC601 Doctoral Seminar in the Process of Inquiry (1 Credit)
This small, team-taught pro-seminar is designed as an introduction to the integration of family science and public health paradigms. The focus is the full, complex "process of inquiry", with emphasis on the conceptualization phase of the process, as it leads to related design, planning, empirical, and analytic phases. Instead of emphasizing content, the pro-seminar will help students develop a broad "way of thinking" about scientific inquiry, which will guide their coursework, assessments, and independent scholarly work during their doctoral training.
Restriction: Must be a first-year student in the Family Science doctoral program or Maternal and Child Health doctoral program; or permission of instructor .

FMSC606 Ethnic Families and Health Disparities (3 Credits)
Historical, psychosocial, economic, and political factors influencing the structure and functioning of ethnic families. Overview of racial and ethnic health disparities over the life course and ways in which they are influenced by multi-level contextual factors.
Credit Only Granted for: FMSC606 or FMST606.
Formerly: FMST606.

FMSC610 Research Methods in Family Science (3 Credits)
Research methods in family science. The role of theory, design, use of qualitative and quantitative measurement techniques, data collection and data analysis. Development of research proposals.
Prerequisite: EDMS645; or students who have taken courses with comparable content may contact the department.
Credit Only Granted for: FMSC610 or FMST610.
Formerly: FMST610.

FMSC630 Family Therapy with Children and Adolescents (3 Credits)
Covers the theory and practice of individual and family therapy with children and adolescents for the treatment of specific psychological disorders and family system challenges. The course covers assessment and unique considerations for treatment management when working with minors as well as specific therapy models and techniques to work with children and adolescents such as structural family therapy, cognitive-behavioral family therapy, attachment-based therapy, and play therapy techniques. The course also includes psycho-educational family interventions and evidence-based practices for assessment and treatment of children and adolescents. The course emphasizes consideration of therapists' and clients' social location as well as socio-culturally attuned, inclusive, and affirming conceptualization, assessment and treatment to serve diverse populations.
Prerequisite: FMSC640.
Restriction: Must be in the Couple and Family Therapy Master's Program.
Credit Only Granted for: FMSC698P or FMSC630.
Formerly: FMSC698P.

FMSC631 Trauma & Addiction in Family Life (3 Credits)
Introduces students to traumatic stress, trauma- and stressor-related disorders, and substance-related and addictive disorders. Students will learn about risk factors for traumatic stress along the lifespan and individual and family resiliency to these conditions. This course will provide students with the tools necessary for assessment and diagnosis of trauma- and stressor-related disorders and substance-related and addictive disorders. Students will become knowledgeable about the short-term and long-term consequences of traumatic stress and learn about research-supported best clinical practices for the treatment of trauma- and stressor-related disorders, and substance-related and addictive disorders. The students will also learn about recognizing and preventing burnout, compassion fatigue, and secondary traumatization.
Credit Only Granted for: FMSC631 or FMSC698A.
Formerly: FMSC698A.

FMSC632 Testing and Assessment in Couple and Family Therapy (3 Credits)
Graduate course in family, couple, and individual testing and assessment. The course will cover typical procedures and instruments for assessing qualities of individual functioning and relationship functioning, in work with families and couples. Study of the assessment process will include test construction and use of standardized tests, assessments, and rating scales. The use of assessment in treatment plans and treatment outcome evaluation, ethical considerations, and the dissemination of information to clients and others are covered. Also, this course will include classic testing and assessment methods, to ensure familiarity with these measures among CFTs.
Restriction: Permission of the Family Science department.
Credit Only Granted for: FMSC698T or FMSC632.
Formerly: FMSC698T.

FMSC635 Integrative LGBTQIA+ Clinical Knowledge and Techniques for Family, Couple and Varie (3 Credits)
Explores the physiological, psychological, and socio-cultural variables associated with sexual expression, identity, orientation, and behavior for the LGBTQ+ population in relation to mental health and clinical contexts. Attention will focus on the clinical context of sex and gender most often presented in therapy with LGBTQ+ individuals, couples, families, and other varied relationship dynamics within the LGBTQ+ Community. The course explores clinician's comfort and level of knowledge, practice, and foundational understanding of sexuality and gender, own self-care systems, and how to navigate challenges and establish support. The course discusses the developmental and biological components of sexuality and gender, clinical diagnosis, and relational theoretical perspectives, desire, and pleasure modalities, relationships around family building, as well caring for the elderly.
Prerequisite: FMSC745, FMSC640, and FMSC641 .

FMSC640 Family Therapy: Theory and Techniques (3 Credits)
Overview of fundamental theoretical concepts and clinical procedures in marital and family therapy, with an emphasis on those therapies which operate from a family systems perspective.
Credit Only Granted for: FMSC640 or FMST640.
Formerly: FMST640.

FMSC641 Couples Therapy, Theory, and Techniques (3 Credits)
Overview of theoretical models of couple relationships and methods of facilitating growth and interaction within those relationships. Emphasis on couples with conflicting needs and expectations, and dysfunctional communication and conflict negotiation skills.
Prerequisite: FMSC640.
Credit Only Granted for: FMSC641 or FMSC641.
Formerly: FMST641.

FMSC642 Normal and Abnormal Individual and Family Development (3 Credits)
Normal development and psychopathology in the family system. Emphasis on parent-child relationships and application of the current Diagnostic and Statistical Manual of Mental Disorders (DSM) to family therapy.
Prerequisite: FMSC640.
Credit Only Granted for: FMSC642 or FMST642.
Formerly: FMST642.

FMSC645 Sexuality: Issues in Family Therapy and Service Delivery (3 Credits)
Typical, dysfunctional, and pathological sexual functioning: effects on individuals, couples, and family systems. Sensitizes students to sexual issues, explores how perceptions or such issues affect work with people, and emphasizes implications for marriage and family therapy.
Prerequisite: Must have completed a basic course in human sexuality.
Restriction: Permission of instructor. Jointly offered with FMSC445.
Credit Only Granted for: FMSC445 or FMSC645.

FMSC646 Sex Therapy: Theory, Skills, and Practice (3 Credits)
Introduction to the theory and practice of sex therapy, including information about human sexual function and dysfunction and appropriate intervention methods. Emphasis on the relationship and the dynamics of sexual functioning within that system.
Prerequisite: FMSC645; or permission of SPHL-Family Science department.

FMSC647 Theory and Techniques of Family Mediation (3 Credits)
An introduction to family mediation as an approach to helping families deal effectively with the issues associated with separation and divorce. Theory, practice, and techniques of negotiation, with an emphasis on custody, property division, and the constructive restructuring of family relationships.
Credit Only Granted for: FMSC647 or FMST647.
Formerly: FMST647.

FMSC650 Ethical, Legal, and Professional Principles in Couple and Family Therapy (3 Credits)
This course offers an introduction to the basic principles and practices in couple and family therapy. It covers major theoretical approaches to couple and family therapy, linking core concepts to practical aspects of assessment and treatment. Readings, didactic presentations by the instructor, and class discussions are designed to build students' knowledge of both generic therapy skills and specific techniques within each theoretical model. Emphasis is given to professional ethics, standards, and clinical skills/techniques necessary for the beginning family practitioner. Students become familiar with professional ethical codes as well as ethical decision-making models and how to apply them in clinical practice. In-class roleplays are used for practicing specific assessment and treatment methods, as well as for gaining experience in responding appropriately to a variety of common professional and ethical issues that arise in clinical practice.
Prerequisite: Permission of SPHL-Family Science department.
Restriction: Must be in Couple and Family Therapy (Master's) program.

FMSC651 Treatment of Emotional and Mental Disorders in the Family Context (3 Credits)
This course is designed to assist beginning therapists in developing their knowledge of the major theoretical approaches to family therapy and applying those approaches to their clinical work. In addition, the course addresses many procedural, professional, and ethical issues often faced by beginning therapists. Towards these ends, the primary foci of the course will be on developing competencies in (a) observing family process, (b) assessing and conceptualizing family strengths and problems from different theoretical models, and (c) developing treatment plans from these different theoretical models. Finally, attention will also be given to therapist self-care.
Prerequisite: FMSC650.
Restriction: Must be in Couple and Family Therapy (Master's) program.

FMSC652 Psychopathology and Diagnosis in Family Systems (3 Credits)
The purpose of this course is to assist intermediate family therapists in further developing their knowledge, clinical, and professional expertise by deepening their understanding of major child and adult psychopathology. Further, students will learn to apply this knowledge to their clinical work, particularly in addressing individual family members' psychopathology within the context of family relationships. Major foci of the course include assessment and diagnostic interviewing in family therapy, and intervention with forms of psychopathology such as depression, anxiety disorders, substance abuse, and major mental disorders with clients who present for couple and family therapy.
Prerequisite: FMSC651.
Restriction: Must be in Couple and Family Therapy (Master's) program.

FMSC653 Advanced Application of CFT Models and Techniques (3 Credits)
This course is an integration of advanced assessment, diagnosis, and treatment procedures with couples, families, individuals, and groups. Emphasis will be on the following areas: (1) the advanced study of classic and emerging CFT models; (2) special topic areas (e.g., trauma, religious differences, grief & loss, family rituals,) and/or collaborative CFT in varied settings (e.g., schools, medical facilities, in-home/family preservation work, foster care, alcohol & drug centers); (3) development of a personal theory/philosophy of family therapy along with a case management system for that model. Additionally, development of the self of therapist, contributions to CFT as a profession, and employment as well as independent practice information including resume development, licensing laws and regulations in Maryland and other states will be explored. Also, procedures for preparing for the National MFT licensing exam will be discussed. Advanced professional practice will be demonstrated in case presentations related to the specific areas emphasized in the course.
Prerequisite: FMSC652.
Restriction: Must be in Couple and Family Therapy (Master's) program.

FMSC654 Clinical Marriage and Family Therapy Practice (3 Credits)
Focuses on the integration of ethics, professional identity, and administrative aspects of clinic operations in a practice setting. This course covers all the administrative duties and responsibilities that students have as interns of the Center for Healthy Families from enrollment to graduation from the Couple and Family Therapy program.
Prerequisite: FMSC651.
Restriction: Must be in Couple and Family Therapy (Master's) program.

FMSC658 Supervised Clinical Practice in Couple and Family Therapy (1-3 Credits)
This course is designed to provide supervision of family, couple, and individual therapy client contact. This course is limited to, and required of, all students admitted to the Couples and Family Therapy (CFT) Program. Supervision utilizes various family systems models and differing methods are employed.
Prerequisite: FMSC650.
Restriction: Permission of instructor.
Repeatable to: 12 credits if content differs.

FMSC660 Program Planning and Evaluation in Family Science (3 Credits)
Theory and methods of program planning and evaluation with special emphasis on family programs. Assessment of program goals and the social and psychological factors involved in program implementation. Methods for measuring the effectiveness of program delivery, as well as the impact of services on family functioning.
Credit Only Granted for: FMSC660 or FMST660.
Formerly: FMST660.

FMSC668 Special Topics in Family Sciences (1-3 Credits)

FMSC686 Law, Public Health and the Cuban Family (4 Credits)
A comparison of family problems in the United States, a capitalist society, with Cuba, a socialist one, as evaluated within the context of legal, public health, social, cultural, and economic changes. The highlight of the course is time spent in Havana, Cuba where students may gain first-hand knowledge of these issues through visits to a hospital, fertility clinic, rural doctor's office, medical school, law offices, museums, and a slave rebellion site and while meeting with the U.S. Ambassador in Cuba, Cuban judges, lawyers, doctors, professors, and health care professionals and the Cuban people as their host families and beyond.
Jointly offered with: FMSC486.
Credit Only Granted for: FMSC486, FMSC686 or MIEH698B.
Additional Information: This is a summer short-term faculty-lead study abroad course which will primarily occur in Cuba. Additionally, the course involves an online component prior to and following the trip.

FMSC689 Research Internship (1-3 Credits)
Research experience resulting in a scholarly article suitable for publication in a peer-reviewed journal.
Prerequisite: Permission of instructor; and permission of SPHL-Family Science department.
Repeatable to: 3 credits if content differs.
Formerly: FMST689.

FMSC698 Advanced Topics in Family Science (1-3 Credits)
Arranged group study on specific topic which may vary from term to term.
Repeatable to: 12 credits.
Formerly: FMST698.

FMSC699 Independent Study (1-6 Credits)
Prerequisite: Permission of SPHL-Family Science department.
Restriction: Permission of instructor.
Repeatable to: 6 credits.
Formerly: FMST699.

FMSC710 Maternal and Child Health from a Life Course Perspective (3 Credits)
Survey of current science in maternal and child health informed by a life course perspective. The surveyed topics include inutero exposure to toxins, feeding and growth, and effects of chronic stress, maternal and child health.
Credit Only Granted for: FMSC710 or FMST710.
Formerly: FMST710.

FMSC720 Study Design in Maternal Child Health Epidemiology (3 Credits)
A detailed survey of key epidemiologic study designs provided through readings, lectures, and exercises. Lectures begin by considering the evolution of epidemiologic thought and parallel developments in design of epidemiologic studies. Topics covered include assessment of causality in observational studies, investigation of acute outbreaks, survey design, cohort and case-control study designs, clinical randomized trials, and discussion of issues pertaining to measurement error in the assessment of exposures and outcomes in epdemiologic studies.
Prerequisite: EPIB610.
Restriction: Permission of the Family Sciences department.
Credit Only Granted for: EPIB612 or FMSC720.

FMSC730 Key Topics in Maternal and Child Health (3 Credits)
Review of key issues on the frontier of maternal and child health research and practice within broad public health and socio-cultural context. Examines current maternal and child health issues such as ethics, child and family health, health and socioeconomic disparities, child nutrition and obesity, military family health, and global health.
Restriction: Permission of instructor.

FMSC740 Reproductive and Perinatal Epidemiology (3 Credits)
Focuses on current research, controversial issues, and methodological challenges in the epidemiology of reproductive and perinatal health. Reproductive health topics will include fertility and fecundity, quality family planning services, hormone replacement therapy, and reproductive health cancers. Perinatal health topics will include fetal growth, adverse pregnancy and birth outcomes, fetal/infant/maternal morbidity and mortality, and birth defects. Lectures will focus on the biology, measurement, and application of study designs and analytic strategies for examining these topics. Course readings and discussions will critically review the broader context of reproductive and perinatal health within families and communities.
Prerequisite: Must have completed a graduate course in epidemiology with a B- or higher.
Credit Only Granted for: FMSC612 or FMSC740.
Formerly: FMSC612.

FMSC745 Diversity and Social Justice In Couple and Family Therapy (3 Credits)
The purpose of this course is to improve students' cultural competence by sensitizing them to sources of bias in family service delivery, particularly those associated with race, culture/ ethnicity, social class, gender, sexual orientation, immigration, spirituality, and ability. Students will be introduced to major critiques of service delivery, couple and family therapy, and research from each of these perspectives, as well as recommendations for addressing these issues in practice.
Credit Only Granted for: FMSC745 or FMST745.
Formerly: FMST745.

FMSC750 Family and Health Policy (3 Credits)
Development and analysis of public policies affecting the health and well-being of children, youth, and families, with an emphasis on low income and ethnic minority populations. Examination of social, economic, and political dynamics that influence family and health policies and the delivery of health care. Introduction to health advocacy within the US public health system.
Credit Only Granted for: FMSC750 or FMST750.
Formerly: FMST750.

FMSC758 Supervision of Marriage and Family Therapy Supervision (1-3 Credits)
Designed to provide supervision of marriage and family therapy supervision. Limited to students who have completed a Marriage and Family Therapy (MFT) Program or its equivalent, have completed an approved MFT supervision course, and are supervisors-in-training. Supervised supervision will incorporate various family systems, models and methods.
Prerequisite: Permission of SPHL-Family Science department.
Repeatable to: 12 credits if content differs.
Formerly: FMST758.

FMSC780 Qualitative Methods in Family and Health Research (3 Credits)
Theoretical perspectives and methodological tools to conduct research with individuals and families across the life span. Review of research designs, participant fieldwork, observation and interview projects, data collection, computer-assisted data analysis, and development of grounded theory.
Restriction: Permission of the Family Sciences department.
Credit Only Granted for: FMSC780 or FMST780.
Formerly: FMST780.

FMSC789 Non-Thesis Research (1-3 Credits)
Non-thesis option research papers.
Repeatable to: 6 credits if content differs.
Formerly: FMST789.

FMSC799 Master's Thesis Research (1-6 Credits)
Formerly: FMST799.

FMSC810 Theory in Family Systems and Family Health (3 Credits)
Theory and research on family interaction and family coping with normative health and mental health transitions and non-normative crises across the family life cycle. Micro-analysis of family process in communication, decision-making, problem-solving, and compliance to health regimens. Examination of dysfunctional patterns and effective coping strategies.
Restriction: Permission of instructor.
Credit Only Granted for: FMSC810, FMST698P, or FMST810.
Formerly: FMST810.

FMSC820 Advanced Quantitative Methods in Family and Health Research (3 Credits)
This seminar is designed to help students understand, evaluate, and develop research conceptualization and design relevant to family science and family health. By the end of the course, students will be able to critique and develop theoretically grounded quantitative research in their respective area of study. Throughout the course, students will be exposed to a broad range of advanced methods that are core to the field of family science. The course will train students on how to conceptualize and develop rigorous empirical research studies relevant to family science and family health.
Recommended: Basic knowledge regarding social science research methods, study design, univariate and bivariate statistics, and family theory.

FMSC850 Maternal & Child Health Epidemiology (3 Credits)
Determinants and trends in Maternal and Child Health, including analysis of the role of economic inequalities, race and ethnicity, community contexts, and psychosocial factors across the life course. Overview of methods and data systems used to monitor Maternal and Child Health. Development of a complete population health study.
Restriction: Permission of instructor.
Credit Only Granted for: FMSC850, FMST698P, or FMST850.
Formerly: FMST850.

FMSC879 Preparing Future Faculty and Professionals Seminar (1 Credit)
Development of skills necessary to obtain and succeed in academic and non-academic positions in family science and public health. Topics include: career mapping, networking, teaching/teaching portfolios, independent research, publishing, grant writing, program and policy evaluation, consulting, job search, interviewing and negotiation, mentoring, diversity, work-family balance, and ethical issues in the workplace. Periodic visits to universities and government/nonprofit employers.
Restriction: Must be in one of the following programs (Family Science (Doctoral); Maternal and Child Health (Doctoral)).
Repeatable to: 4 credits.

FMSC898 Pre-Candidacy Research (1-8 Credits)
Formerly: FMST898.

FMSC899 Doctoral Dissertation Research (1-8 Credits)
Formerly: FMST899.

FREN - French

FREN407 History of the French Language (3 Credits)
Evolution of the French language from Latin to modern French. Taught in French.
Prerequisite: FREN351 or FREN352; or permission of ARHU-French & Italian Languages & Literatures department.

FREN414 French for International Relations (3 Credits)
Historically, French has played a key role in the development and organization of International Relations. It remains an important tool for diplomats and an official working language of major international organizations. Students will be introduced to the French vocabulary and terminology specific to diplomatic discourse and the field of International Relations. Through French-speaking media analysis and simulated work-related situations in an international context, students will learn how to pitch a project, present a country situation, give a thematic presentation, and engage in successful negotiations. Students will also acquire the skills and proficiency to understand and produce professional documents used in the International Relations field. Taught in French.
Prerequisite: FREN387.

FREN421 Francophone African Film (3 Credits)
Imaginary and Memory in the reality of Francophone African Film from 1960-present. Taught in English.
Cross-listed with: CINE421.
Credit Only Granted for: FREN421, CINE421 or FILM421.
Formerly: FILM421.

FREN423 Women and French Cinema (3 Credits)
Cultural identity, social boundaries and gender roles in French film as well as introduction to film textual analysis and diverse film theories (semiotics, film and psychoanalysis, feminist film theory, structuralism, narratology, spectatorship and cultural studies). Taught in English.
Cross-listed with: CINE423.
Credit Only Granted for: FREN423, CINE423 or FILM423.
Formerly: FILM423.

FREN429 Studies in French Literature and Culture of the Renaissance (3 Credits)
Selected topics in French literature of the Renaissance.
Prerequisite: FREN387; and (FREN351 or FREN352). Or permission of ARHU-French & Italian Languages & Literatures department.
Repeatable to: 6 credits if content differs.

FREN439 Studies in 17th Century French Literature and Culture (3 Credits)
Selected topics in seventeenth-century French literature.
Prerequisite: FREN387; and (FREN351 or FREN352). Or permission of ARHU-French & Italian Languages & Literatures department.
Repeatable to: 6 credits if content differs.

FREN449 Studies in 18th Century French Literature and Culture (3 Credits)
Selected topics in eighteenth-century French literature.
Prerequisite: FREN387; and (FREN351 or FREN352). Or permission of ARHU-French & Italian Languages & Literatures department.
Repeatable to: 6 credits if content differs.

FREN459 Studies in 19th Century French Literature and Culture (3 Credits)
Selected topics in nineteenth-century French literature.
Prerequisite: FREN387; and (FREN351 or FREN352). Or permission of ARHU-French & Italian Languages & Literatures department.
Repeatable to: 6 credits if content differs.

FREN469 Studies in 20th Century French Literature and Culture (3 Credits)
Selected topics in twentieth-century French literature.
Prerequisite: FREN387; and (FREN351 or FREN352). Or permission of ARHU-French & Italian Languages & Literatures department.
Repeatable to: 6 credits if content differs.

FREN472 The Construction of French Identity II: From the Revolution to the Early Twentieth Century (3 Credits)
French life, customs, culture, traditions (1750 to the early twentieth century).
Prerequisite: FREN387; or permission of ARHU-French & Italian Languages & Literatures department.

FREN474 Contemporary France: A Sociocritical Approach (3 Credits)
A sociocritical approach to understanding modern French society through the study of print and non-print media documents (autobiography, film, and paraliterature), with reference to the Francophone world. Taught in French.
Prerequisite: FREN387; or permission of ARHU-French & Italian Languages & Literatures department.
Recommended: FREN473.

FREN478 Themes and Movements of French Literature in Translation (3 Credits)
Studies treatments of thematic problems or literary or historical movements in French literature. Topic to be determined each semester. Taught in English.

FREN479 Masterworks of French Literature in Translation (3 Credits)
Treats the works of one or more major French writers. Topic to be determined each semester. Taught in English.

FREN480 French Cinema: A Cultural Approach (in Translation) (3 Credits)
A study of French culture, civilization, and literature through the medium of film. Taught in English.
Cross-listed with: CINE420.
Credit Only Granted for: FREN480, CINE420 or FILM420.
Formerly: FILM420.

FREN482 Gender and Ethnicity in Modern French Literature (3 Credits)
Literature by women writers of France and other French speaking areas with a focus on the relationship between gender, ethnicity and writing. Taught in English.

FREN488 Special Topics in Francophone Studies (3 Credits)
Topic and language of instruction to be announced when offered.
Repeatable to: 9 credits if content differs.

FREN489 Seminar in Themes or Movements of French Literature (3 Credits)
Seminar on selected themes or movements of French literature.
Prerequisite: FREN387; and (FREN351 or FREN352). Or permission of ARHU-French & Italian Languages & Literatures department.
Repeatable to: 6 credits if content differs.

FREN495 Honors Thesis Research (3 Credits)
The writing of a paper under the direction of a professor in this department and an oral examination. Required to fulfill the departmental honors requirement.
Restriction: Must be admitted to the departmental honors program.

FREN498 Special Topics in French Literature (3 Credits)
Selected topics in French literature.
Prerequisite: FREN387; and (FREN351 or FREN352). Or permission of ARHU-French & Italian Languages & Literatures department.
Repeatable to: 6 credits if content differs.

FREN499 Special Topics in French Studies (3 Credits)
An aspect of French studies, the specific topic to be announced each time the course is offered.
Prerequisite: FREN387; or permission of ARHU-French & Italian Languages & Literatures department.
Repeatable to: 6 credits if content differs.

FREN600 Literary History, Theories, and Methodologies for French and Francophone studies (3 Credits)
Review of major movements in French and Francophone literature and introduction to theories and methods used in the field. Readings, discussions, and coursework in both French and English

FREN601 The History of the French Language (3 Credits)

FREN609 Special Topic in the French Language (3 Credits)

FREN611 The Structure of the French Language (3 Credits)
Phonology, morphology, syntax and semantics of modern French. Collection and critical analysis of language data.

FREN619 Special Topic in Medieval French Literature (3 Credits)

FREN629 Special Topic in Sixteenth Century French Literature (3 Credits)

FREN639 Special Topic in Seventeenth Century French Literature (3 Credits)

FREN649 Special Topic in Eighteenth Century French Literature (3 Credits)

FREN659 Special Topic in Nineteenth Century French Literature (3 Credits)

FREN665 Contemporary French Theater (3 Credits)
Examines selected plays from French contemporary theater (20th-21st c.) with a particular focus on new trends in writing, performing, and staging as they reflect the crisis faced by playwrights in particular, and French society in general at the aesthetic, social, and political levels. Students will explore different approaches to the analysis of theater plays and familiarize themselves with the evolution of mise-en-scene throughout the 20th century until the present day.

FREN669 Special Topics in Twentieth Century French Literature (3 Credits)

FREN679 The History of Ideas of France (3 Credits)
Analysis of currents of ideas as reflected in different periods and authors of French literature.

FREN689 Seminar in a Great Literary Figure (3 Credits)

FREN699 Seminar (3 Credits)
Topic to be determined each semester.

FREN709 College Teaching of French (1 Credit)
Introduction to the teaching of French at the college level with particular emphasis on methodology. Seminars in theory, demonstration of different teaching techniques, supervised practice teaching, training in language laboratory procedures, evaluation of instructional materials. Required of all graduate assistants in French.
Repeatable to: 2 credits.

FREN798 Master's Independent Study (1-3 Credits)
Prerequisite: Permission of ARHU-School of Languages, Literatures, and Cultures department.
Repeatable to: 3 credits.

FREN799 Master's Thesis Research (1-6 Credits)

FREN818 French Literary Criticism (3 Credits)
Analysis and evaluation of various trends in literary criticism. Topic to be determined each semester.

FREN889 Doctoral Independent Study (3 Credits)
Repeatable to: 6 credits.

FREN898 Pre-Candidacy Research (1-8 Credits)
Repeatable to: 6 credits.

FREN899 Doctoral Dissertation Research (1-8 Credits)

GEOG - Geographical Sciences

GEOG413 Migration: Latin America and the United States (3 Credits)
Develops an understanding of the push and pull factors that have contributed to human mobility (migration) that has transformed the Americas. The class is divided in two parts: immigration and emigration from Latin American and Latin America migration to the United States. We will be interested in studying the migration shifts that have occurred in Latin America and the theories that help explain them. The themes that will be addressed are the history of migration with Latin America and to North America, the impact of this migration on both sending and receiving countries, and the various policy strategies and issues concerning migration.
Prerequisite: GEOG313; or permission of BSOS-Geography department.
Recommended: HIST250; or USLT201; or LASC234.
Credit Only Granted for: GEOG413, or GEOG498M.
Formerly: GEOG498M.

GEOG415 Land Use, Climate Change, and Sustainability (3 Credits)
The issues of climate change and land use change as two interlinked global and regional environmental issues and their implications for society and resource use are explored.
Prerequisite: GEOG201.

GEOG416 Conceptualizing and Modeling Human-Environmental Interactions (3 Credits)
Develops skills to carry out research that integrates environmental and economic aspects of sustainability by introducing extensively used quantitative tools for analyzing human-environmental interactions in the field of ecological economics. These include, e.g., index number calculations and decomposition analysis, Environmental Kuznets Curve (EKC), environmental input-output analysis and life-cycle analysis, and multi-criteria decisions aid (MCDA). Students will need laptops to run models during class.
Prerequisite: Permission of BSOS-Geography department.
Corequisite: MATH130, MATH140, or MATH120; or MATH220.

GEOG417 Land Cover Characterization Using Multi-Spectral Remotely Sensed Data Sets (3 Credits)
Students will be introduced to the image processing steps required for characterizing land cover extent and change. Key components of land cover characterization, including image interpretation, algorithm implementation, feature space selection, thematic output definition, and scripting will be discussed and implemented.
Prerequisite: GEOG272 or permission of instructor.
Jointly offered with: GEOG617.
Credit Only Granted for: GEOG417 or GEOG617.

GEOG418 Field and Laboratory Techniques in Environmental Science (1-3 Credits)
Lecture and laboratory learning each week. A variable credit course that introduces field and laboratory analyses in environmental science. Individual learning contract are developed with instructor.
Restriction: Permission of BSOS-Geography department.
Credit Only Granted for: GEOG418 or GEOG448.
Formerly: GEOG448.

GEOG421 Changing Geographies of China (3 Credits)
Covers physical geography, history, and economic and political systems of the world's most populous country. The major focus will be on geographical issues in China's contemporary development: agriculture, population, urbanization, resource and energy, and environment.
Prerequisite: Permission of BSOS-Geography department. Or GEOG202; and GEOG201; and (GEOG435, GEOG333, or GEOG332).
Recommended: GEOG130; or GEOG140.
Credit Only Granted for: GEOG328B or GEOG421.
Formerly: GEOG328B.

GEOG422 Changing Geographies of Sub-Saharan Africa (3 Credits)
Students will develop an understanding of the geographic contexts of SubSaharan Africa, including an overview of the physical, bioclimatic, historical, cultural, political, demographic, health and economic geographies of Sub-Saharan Africa. Students will fill in the map of Africa by studying the spatial distribution within each of these geographic domains. In addition to an overview of geography South of the Sahara, the Congo will be taken as a more intensive case study through additional readings, lectures and discussions.
Prerequisite: GEOG201.
Recommended: GEOG130 or GEOG110.
Credit Only Granted for: GEOG422 or GEOG788A.

GEOG423 Latin America (3 Credits)
A geography of Latin America and the Caribbean in the contemporary world: political and cultural regions, population and natural resource distribution, economic and social development, poverty, crime, urbanization, migration trends, and natural disasters.
Prerequisite: Permission of BSOS-Geography department. Or GEOG201 and GEOG202; and (GEOG332, GEOG435, or GEOG333).
Recommended: GEOG130 and GEOG110.
Credit Only Granted for: GEOG313 or GEOG423.
Formerly: GEOG313.

GEOG431 Culture and Natural Resource Management (3 Credits)
Basic issues concerning the natural history of humans from the perspective of the geographer. Basic components of selected behavioral and natural systems, their evolution and adaptation, and survival strategies.
Credit Only Granted for: GEOG421 or GEOG431.
Formerly: GEOG421.

GEOG432 Spatial Econometrics (3 Credits)
An introduction to modern econometric techniques in general and spatial econometrics in particular, using the popular open source statistical computer language R. A focus on using statistical computing to produce analytical reports for real-world applications, research papers, and dissertations.
Prerequisite: Permission of BSOS-Geography department.
Jointly offered with: GEOG732.
Credit Only Granted for: GEOG432 or GEOG732.

GEOG438 Seminar in Human Geography (3 Credits)
Selected topics in human geography.
Recommended: GEOG201; or GEOG211.
Restriction: Permission of BSOS-Geography department.
Repeatable to: 6 credits if content differs.

GEOG440 Polar Remote Sensing (3 Credits)
The harsh environment of the vast polar regions makes them some of the most inaccessible places on Earth. With widespread environmental change already underway, satellite remote sensing provides the only means by which to obtain year-round observations of the polar climate system. The objective of this course is to provide students with an overview of polar remote sensing techniques, including the physical principles of active and passive sensors, orbits, electromagnetic radiation, atmospheric transmission, calibration and validation. We will focus on measurements of the polar oceans, sea ice, glaciers, ice sheets, snow and permafrost, and examine the response of the cryosphere to climate change.
Prerequisite: PHYS171 or PHYS161; and AOSC401 or GEOG301; or with permission of instructor.
Cross-listed with: AOSC440.
Jointly offered with: AOSC642.
Credit Only Granted for: AOSC440, GEOG440, AOSC642, or GEOG640.

GEOG441 The Coastal Ocean (3 Credits)
Introduction to coastal oceanography, focusing on the physical, biological, and geological aspects of ocean areqs on the inner continental shelves. Wave, currents, and tidal dynamics of bays, open coast, estuaries, and deltas. Sedimentary environments of major coastal types. Ecology and biogeochemical relationships, including benthic and planktonic characteristics. Coastal evolution with sea level rise. Human impacts: eutrophication, modification of sedimentation. The coastal future: rising sea level, hypoxia, and increased storminess.
Prerequisite: GEOG201.

GEOG442 Biogeography and Environmental Change (3 Credits)
Biogeographical topics of global significance, including a consideration of measurement techniques, and both descriptive and mechanistic modeling. Topics may include: scale in biogeography, biodiversity, carbon geography, climate and vegetation, interannual variability in the biosphere, land cover, global biospheric responses to climate change, NASA's Mission to Planet Earth and Earth Observation System. The class focuses on both natural and athropogenic controls, impacts of biography on climate and ecosystem services and different methods in biogeography.
Prerequisite: GEOG201.
Jointly offered with: GEOG642.
Credit Only Granted for: GEOG642 or GEOG442.

GEOG458 Special Topics in Study Abroad IV (1-6 Credits)
Special topics course taken as part of an approved study abroad program.
Repeatable to: 15 credits if content differs.

GEOG461 Machine Learning for Computational Earth Observation Science (CEOS) (3 Credits)
Provides an introduction to machine learning methods and models with an emphasis on Earth observation. Topics will include supervised (decision trees, random forest, neural networks, support vector machine, Gaussian process and ensemble techniques), and unsupervised techniques (clustering/segmentation, dimension reduction, multi-dimensional data visualization). The course will highlight the state-of-the-art deep learning models; object-based versus pixel-based image classification; how to deal with missing data and non-uniform coverage of data; and large scale land cover land use mapping from heterogenous satellite data. Practical part will include satellite image classification by applying classification models and biophysical parameters retrieval by applying regression models.
Prerequisite: GEOG272.

GEOG470 Algorithms for Geospatial Computing (3 Credits)
An introduction to fundamental geospatial objects and geometric algorithms for spatio-temporal data processing and analysis. Point data representation and analysis: spatial data models and data structures, algorithms for spatial queries, point clustering algorithms. Surface and scalar field modeling, such as terrains: raster and triangle-based models (TINs), algorithms for building and querying TINs. Algorithms for natural and urban terrain analysis: morphology computation and visibility analysis. Applications to processing and analysis of LiDAR (Light Detection And Ranging) data in the context of terrain reconstruction, urban modeling, forest management and bathymetry reconstruction for coastal data management. Road network computation and analysis: algorithms for route computation in road networks, and for road network reconstruction from GPS and satellite data.
Prerequisite: GEOG276; or a minimum grade of C- in CMSC330 and CMSC351; or permission of instructor.
Cross-listed with: CMSC401.
Jointly offered with: GEOG770.
Credit Only Granted for: CMSC498Q, CMSC401, CMSC788I, GEOG470, GEOG498I, GEOG770, or GEOG788I.
Formerly: GEOG498I.

GEOG471 Technologies for Computational Earth Observations (3 Credits)
An introduction and exploration of cutting-edge novel remote sensing datasets and their associated science uses and applications. We present several modules focused on different technologies (multispectral, lidar, radar, thermal), and for each have both hands-on lab assignments, lectures, and applications case studies. Data fusion techniques, and common analysis and processing pitfalls are presented and discussed. Hands-on computer labs allow students to explore each dataset via online tutorials. After all datasets are presented, students download their own datasets in an area of interest to them, and work toward a unique student-driven project for presentation to the class. The sky is literally the limit in this interactive course which provides a research experience opportunity for students in a supportive atmosphere.
Prerequisite: GEOG371 or permission of instructor.

GEOG472 Remote Sensing: Digital Processing and Analysis (3 Credits)
Digital image processing and analysis applied to satellite and aircraft land remote sensing data. Consideration is given to image preprocessing techniques including radiometric calibration, geometric registration as well as atmospheric correction. Analysis methods include digital image exploration, feature extraction, thematic classification, change detection, and biophysical characterization. An application-oriented course project will be completed through the self-guided computer labs.
Prerequisite: GEOG272.
Recommended: GEOG371, GEOG306 or equivalent.

GEOG473 Geographic Information Systems and Spatial Analysis (3 Credits)
Analytical uses of geographic information systems; data models for building geographic data bases; types of geographic data and spatial problems; practical experience using advanced software for thematic domains such as terrain analysis, land suitability modeling, demographic analysis, and transportation studies.
Prerequisite: GEOG306 and GEOG373; or students who have taken courses with comparable content may contact the department.
Credit Only Granted for: GEOG473 or GEOG482.
Formerly: GEOG482.

GEOG475 Geographic Visualization and Digital Mapping (3 Credits)
An overview of the basic concepts and techniques that underlie digital map making and the broader field of geographic visualization for intermediate GIS users. This includes the use of color, map symbolization, map layout, and also the contribution to geographic visualization from the fields of scientific visualization, information visualization, and cognition. Fundamentals of dynamic map design and web mapping will be introduced through the use of animated and interactive maps.
Prerequisite: GEOG373 and GEOG306.

GEOG476 Object-Oriented Computer Programming for GIS (3 Credits)
Expands on conceptual and practical aspects of programming for geographic applications. The main focus of this course is to provide students more advanced programming in object oriented programming languages (i.e. Python). In addition, students will develop a proficiency in applying these advanced programming principles to manipulating spatial data sources within the Geographic Information Systems (GIS).
Prerequisite: GEOG373 and GEOG376; or permission of BSOS-Geography department. And must have completed MATH220; or must have completed or be concurrently enrolled in MATH120, MATH130, or MATH140.
Restriction: Must be in Geography program; or must be in GIS minor.

GEOG498 Topical Investigations (1-3 Credits)
Independent study under individual guidance.
Prerequisite: Restricted to advanced undergraduate students; and 24 credits in GEOG courses. Or restricted to graduate students.
Repeatable to: 6 credits if content differs.

GEOG601 The Nature and Practice of Science (3 Credits)
Introduces students to the nature and practice of science in physical and human geography, including practical methods for research productivity, professional, societal and ethical obligations of scientists, the philosophy of science, and the scientific literature. Students will prepare and critically evaluate research proposals.
Restriction: Permission of BSOS-Geography department.
Credit Only Granted for: GEOG601 or GEOG788N.
Formerly: GEOG788N.

GEOG603 Masters Research Tutorial (3 Credits)
Development of Masters scholarly paper topic, critical literature review, formulation of geographical approach to research methodology. Individual meetings with faculty. Comprehensive exam before the end of the semester.
Prerequisite: GEOG600.
Restriction: Permission of BSOS-Geography department.
Credit Only Granted for: GEOG603 or GEOG610.
Formerly: GEOG610.

GEOG606 Quantitative Spatial Analysis (3 Credits)
Multivariate statistical method applications to spatial problems. Linear and non-linear correlation and regression, factor analysis, cluster analysis. Spatial statistics including: trend surfaces, sequences, point distributions. Applications orientation.
Prerequisite: GEOG305; or permission of BSOS-Geography department.
Credit Only Granted for: GEOG605 or GEOG606.
Formerly: GEOG605.

GEOG608 Comprehensive Portfolio Assessment Summary (1-3 Credits)
Evaluation of a PhD student's portfolio.
Repeatable to: 3 credits.

GEOG609 Seminar in Remote Sensing (3 Credits)
Topics in Remote Sensing: These may include agricultural, forestry, coastal environments, urban environments, and other major applications of remote sensing. Also may focus on new and existing earth observation missions dedicated to land research.
Prerequisite: GEOG480.
Repeatable to: 6 credits if content differs.

GEOG615 Land Cover and Land Use Change (3 Credits)
This class provides an examination of land cover and land use change science, addressing the causes, impacts and projection of change. Key concepts of land use science are presented and recent research papers and case studies are reviewed. Class consists of lectures, invited presentations and individual student projects and presentations.
Prerequisite: GEOG442, GEOG472, GEOG435, or GEOG473; or permission of BSOS-Geography department.

GEOG617 Land Cover Characterization Using Multi-Spectral Remotely Sensed Data Sets (3 Credits)
Students will be introduced to the image processing steps required for characterizing land cover extent and change. Key components of land cover characterization, including image interpretation, algorithm implementation, feature space selection, thematic output definition, and scripting will be discussed and implemented.
Prerequisite: Permission of BSOS-Geography department.
Jointly offered with: GEOG417.
Credit Only Granted for: GEOG417 or GEOG617.

GEOG618 Seminar in Geomorphology (3 Credits)
Selected topics; this can include discussion of empirical and theoretical research methods applied to geomorphological problems including review of pertinent literature.

GEOG628 Seminar in Climatology (3 Credits)
Selected topics in climatology chosen to fit the individual needs of advanced students.
Restriction: Permission of BSOS-Geography department.
Repeatable to: 6 credits if content differs.

GEOG630 Climate, Energy, and Policy (3 Credits)
Students will learn about climate change and energy policy from multiple perspectives including social economic, technological, scientific, and behavioural aspects and their interdependence. The course will also consider the report of the Intergovernmental Panel on Climate Change on mitigation and applied cost/benefit analysis of Climate Change.
Prerequisite: Permission of BSOS-Geography department; or enrolled in the Geographical Sciences Graduate Program(s).
Credit Only Granted for: GEOG430, GEOG630, or GEOG788E.
Formerly: GEOG788E.
Additional Information: This course will make occasional use of the popular open source statistical computer language R for practical workshops.

GEOG638 Seminar in Biogeography (3 Credits)
Topics in Biogeography: Biological aspects of Geography. These may include ecology, biodiversity, climate-vegetation interactions, impacts of global change.
Prerequisite: Must have completed 6 credits of biogeography or ecology; or students who have taken courses with comparable content may contact the department.
Repeatable to: 6 credits if content differs.

GEOG639 Seminar in Physical Geography (3 Credits)
Examination of selected themes and problems in physical geography.
Restriction: Permission of BSOS-Geography department.
Repeatable to: 6 credits if content differs.

GEOG640 Polar Remote Sensing (3 Credits)
The harsh environment of the vast polar regions makes them some of the most inaccessible places on Earth. With widespread environmental change already underway, satellite remote sensing is the only way to obtain year-round observations of the polar climate system. The objective of this course is to provide students with an overview of polar remote sensing techniques, including the physical principles of active and passive sensors, orbits, electromagnetic radiation, atmospheric transmission, calibration and validation. We will focus on measurements of the polar oceans, sea ice, glaciers and ice sheets and examine the response of the cryosphere to climate change.
Prerequisite: PHYS171 or PHYS161; and AOSC401 or GEOG301; or with permission of instructor.
Cross-listed with: AOSC642.
Jointly offered with: AOSC440.
Credit Only Granted for: AOSC440, GEOG440, AOSC642, or GEOG640.

GEOG642 Biogeography and Environmental Change (3 Credits)
Biogeographical topics of global significance, including a consideration of measurement techniques, and both descriptive and mechanistic modeling. Topics may include: scale in biogeography, biodiversity, carbon geography, climate and vegetation, interannual variability in the biosphere, land cover, global biospheric responses to climate change, NASA's Mission to Planet Earth and Earth Observation System. The class focuses on both natural and athropogenic controls, impacts of biography on climate and ecosystem services and different methods in biogeography.
Restriction: Permission of BSOS-Geography department.
Credit Only Granted for: GEOG642 or GEOG442.

GEOG646 Programming for GIS (3 Credits)
An introduction to computer programming using Python and web programming languages. It is required for students in the MSGIS program before they enroll in more advanced programming courses (GEOG656 and GEOG657). This course teaches students the fundamentals concepts of computer science. Students will learn about the components of a computer program such as data management, conditional statements, iterative statements, and file processing. Students will develop programs and web apps for the purpose of automating tasks and assisting with data analysis.
Additional Information: This class is recommended for all MSGIS students who have no prior computer programming background as well as those who wish to have additional practice. The skills learned in this class will be useful for more advanced courses such as GEOG656 (Programming and Scripting for GIS), GEOG657 (Web Programming), and GEOG650 (Mobile GIS).

GEOG648 Seminar in Cultural Geography (3 Credits)
Examination of selected themes and problems in cultural geography.
Repeatable to: 6 credits if content differs.

GEOG650 MOBILE GIS (3 Credits)
This course covers how to create, test, and publish mobile GIS applications that work across multiple platforms (Android, iOS, and Black Berry Tablet OS) and adapt to a smartphone or tablet display.
Prerequisite: GEOG657.
Restriction: Must be in Geospatial Information Sciences (Master's) program; or must be in Graduate Certificate: Professional Studies-Geospatial Information Sciences.

GEOG651 Spatial Statistics (3 Credits)
This course is about quantitative analysis of spatial data. It is intended to provide a broad survey of various methods of exploratory statistical data analysis most useful in environmental and social sciences. The course is a mix of theory, methods, and applications geared towards helping students: (1) develop an understanding of the important theoretical concepts in spatial data analysis; and (2) gain practical experience in application of spatial statistics to a variety of social and environmental problems using advanced statistical software.
Restriction: Must be in Geospatial Information Sciences (Master's) program; or must be in Graduate Certificate: Professional Studies-Geospatial Information Sciences.

GEOG652 Digital Image Processing and Analysis (3 Credits)
Digital image processing and analysis applied to satellite and aircraft land remote sensing data. Consideration is given to preprocessing steps including calibration and geo registration. Analysis methods include digital image exploration, feature extraction thematic classification, change detection, and biophysical characterization. One or more application examples may be reviewed.
Restriction: Must be in Geospatial Information Sciences (Master's) program; or must be in the Geospatial Information Sciences (Graduate Certificate) program.

GEOG653 Spatial Analysis (3 Credits)
Methods of spatial analysis including measuring aspects of geometric features and identifying spatial patterns of geospatial objects that are represented as point, line, network, areal data, and 3-D surfaces.
Prerequisite: GEOG579; or students who have taken courses with comparable content may contact the department.
Restriction: Must be in Geospatial Information Sciences (Master's) program; or must be in the Geospatial Information Sciences (Graduate Certificate) program.

GEOG654 GIS and Spatial Modeling (3 Credits)
Provide foundations and understanding on various issues related to modeling and simulation in GIS context. It will addresses the concepts, tools, and techniques of GIS modeling, and presents modeling concepts and theory as well as provides opportunities for hands-on model design, construction, and application. The focus will be on raster-based modeling. This course is also application-orientated, particularly in these fields such as terrain modeling, LULC modeling, hydrological modeling, suitability modeling, etc.
Prerequisite: GEOG653.
Restriction: Must be in Geospatial Information Sciences (Master's) program; or must be in Graduate Certificate: Professional Studies-Geospatial Information Sciences.

GEOG655 Spatial Database System (3 Credits)
This course is designed to help students understand, analyze, design, and implement spatial databases. While the basic concepts and theories of database will be introduced, the focus of this course will be on providing students with hands-on experiences to practice the technical skills used in spatial database design and implementation. SQL, Oracle, and ArcSDE are the key topics.
Prerequisite: GEOG653.
Restriction: Must be in Geospatial Information Sciences (Master's) program; or must be in Graduate Certificate: Professional Studies-Geospatial Information Sciences.

GEOG656 Advanced Programming for GIS (3 Credits)
Programming and scripting for intermediate GIS users. The fundamental concepts of computer programming will be introduced within the Geoprocessing framework in ArcGIS primarily using Python. Concepts of object-oriented programming and scripting will be presented. Students will develop skills in programming techniques to explore, manipulate and model spatial data using the Geoprocessor methods.
Prerequisite: GEOG653.
Restriction: Must be in Geospatial Information Sciences (Master's) program; or must be in Graduate Certificate: Professional Studies-Geospatial Information Sciences.

GEOG657 Web Programming (3 Credits)
Intermediate course designed to teach students the techniques for Web development, particularly creating dynamic and data-driven Web applications. Introduces a high-level, object-oriented programming language such as VB.Net and the designing, coding, debugging, testing, and documenting for the development of Web-based applications. Other popular Web development tools such as DHTML, CSS and PHP are also covered.
Prerequisite: GEOG653.
Restriction: Must be in Geospatial Information Sciences (Master's) program; or must be in Graduate Certificate: Geospatial Information Sciences program.
Credit Only Granted for: GEOG657 or GEOG788R.
Formerly: GEOG788R.

GEOG658 Seminar in Historical Geography (3 Credits)
An examination of themes and problems in historical geography with reference to selected areas.
Restriction: Permission of BSOS-Geography department.
Repeatable to: 6 credits if content differs.

GEOG660 Advanced Remote Sensing Using Lidar (3 Credits)
Lidar, also known as laser scanning, is an active remote sensing tool that can produce high-resolution point clouds. Lidar is being applied to problems such as terrain modeling, biomass estimation, change detection, feature extraction, and measuring tree canopy. Topics covered are fundamentals of lidar, current developments in lidar technology, and different applications where lidar is being used. Students will get hands-on learning about lidar data management, processing, and analysis.
Prerequisite: GEOG652.
Recommended: GEOG656 and GEOG654.
Credit Only Granted for: GEOG660 or GEOG788G.
Formerly: GEOG788G.

GEOG661 Fundamentals of Geospatial Intelligence (3 Credits)
Geospatial Intelligence (GEOINT) is the collection, analysis, visualization and dissemination of geospatial information to support decision-making. This course introduces the fundamental knowledge required to become a successful GEOINT practitioner, including the history of the GEOINT discipline, the intelligence applications of remote sensing and Geographic Information Systems (GIS) technologies, and how GEOINT products are used to support national security and humanitarian missions. Upon completion of this course you will understand the roles that technology, policy, doctrine, government, and industry play in shaping the Geospatial Intelligence discipline, and develop the technical knowledge and domain expertise to create basic GEOINT products that provide context for decision makers.

GEOG662 Advances in GIS and Remote Sensing (3 Credits)
Focuses on state-of-the-art advances in geographic information science and remote sensing as they support geospatial intelligence. Focus on synergies between GIS and remote sensing in informatics, computer science, and spatial engineering, and their application to problem domains in human systems, physical systems, and cyberspace. Advances in GIS presents recent advances regarding fundamental issues of geo-spatial information science (space and time, spatial analysis, uncertainty modeling and geo-visualization), and new scientific and technological research initiatives for geo-spatial information science (such as spatial data mining, mobile data modeling, and location-based services). Advances in remote sensing will provide opportunity to understand and work with latest developments in the Remote Sensing datasets. The curriculum covers wide range of remote sensing data interpretation and their processing techniques.
Restriction: Students taking the course must be familiar with data structures, basic GIS and RS concepts, and demonstrate basic understanding of using GIS and RS software. And must be enrolled in Geographical Sciences MPS or graduate certificate program; or permission of BSOS-Geography department.

GEOG663 Big Data Analytics (3 Credits)
Provides a comprehensive introduction to big data analytics, emphasizing statistical and machine learning techniques for analyzing large datasets. While rooted in geography and spatial sciences, the course is broadly applicable across socio-behavioral sciences. Students will gain hands-on experience with industry-standard tools and frameworks for data exploration, modeling, and visualization. Topics covered include foundational data analytics methods using R, clustering techniques, regression analysis, text analysis, and deep learning with Keras and TensorFlow. The course also explores geospatial machine learning in ArcGIS, big data processing with Hadoop and Spark, and working with distributed computing frameworks such as MapReduce, Pig, Hive, and NoSQL databases.
Recommended: Students taking the course must be familiar with data structures, basic GIS and RS concepts, and demonstrate basic understanding of using GIS and RS software.
Restriction: Permission of BSOS-Geography department; or must be enrolled in Geographical Sciences MPS or graduate certificate program.

GEOG664 GEOINT Systems and Platforms (3 Credits)
There are numerous systems and platforms that support the collection, visualization and dissemination of Geospatial Intelligence (GEOINT). Platforms such as satellites and aircraft carry sensors systems that can detect both physical and man-made objects on the earth. Ground-based processing systems are used to analyze and visualize sensor data, and also to create and disseminate GEOINT products that guide decision-making. In this course you will learn how to develop and implement source-to-screen GEOINT workflows, and will understand how to use a system of systems approach to describe the programmatic and technical strengths and weaknesses of many different GEOINT systems and platforms.

GEOG665 Algorithms for Geospatial Intelligence Analysis (3 Credits)
Exposes students to fundamental algorithms in geospatial intelligence and their application in methodological and substantive domains, and their implementation in computer programs and software systems. Current topics include spatial and space-time analysis, cartographic transformations, data compression and reduction, MapReduce and distributed data access, genetic algorithms, clustering and indexing algorithms, filtering algorithms, geometry and tessellation algorithms, routing algorithms, localization algorithms, and complexity and scaling. Implementation of algorithms will be explored through pseudo-code and a variety of scripting, data access, and programming languages.
Recommended: Students taking the course must be familiar with data structures, basic GIS and RS concepts, and demonstrate basic understanding of using GIS and RS software.
Restriction: Permission of BSOS-Geography department; or must be enrolled in Geographical Sciences MPS or graduate certificate program.

GEOG666 Drones for Data Collection (3 Credits)
Topics covered in this class include: how to prepare students to obtain their FAA Remote Pilot License, understand how to pick drone systems for a data need, and utilize Pix4D to process drone imagery. Before talking about data students will learn about drone and aviation specific laws that will affect them while carrying out operations. Once legal limitations of drone flights have been covered the course will shift toward learning how to select a drone system based on specifications of the equipment and needs of the project and flying. Students will then move on to data processing utilizing Pix4D, Python, and Bash to clean data and automate processing.
Prerequisite: GEOG646 or GEOG656.
Restriction: Must be in Geospatial Information Sciences (Master's) program; or must be in Graduate Certificate: Professional Studies-Geospatial Information Sciences.
Credit Only Granted for: GEOG688E or GEOG666.
Formerly: GEOG688E.

GEOG668 Seminar in Economic Geography (3 Credits)
Examination of themes and problems in the field of economic geography.
Restriction: Permission of BSOS-Geography department.
Repeatable to: 6 credits if content differs.

GEOG670 Open Source GIS (3 Credits)
An exploration of techniques for using Free and Open Source Software for GIS (FOSS4g) from conception to final presentation of results. Advanced concepts and techniques including enterprise GIS, spatial SQL, parallel processing, and displaying the results of GIS analysis over the Internet will also be covered.
Credit Only Granted for: GEOG670 or GEOG788A.
Formerly: GEOG788A.
Additional Information: Students do not need any experience using open source GIS, but students are expected to be comfortable using a desktop GIS such as ArcGIS.

GEOG672 Biophysics of Optical Remote Sensing (3 Credits)
Biophysical principles, phenomena and processes underlying multispectral remote sensing in the optical portion of the EM spectrum. Includes computer-based exercises that explore the biophysical basis of land patterns and dynamics observed in remote sensing data.
Prerequisite: GEOG472; or students who have taken courses with comparable content may contact the department; or permission of BSOS-Geography department.

GEOG677 Web GIS (3 Credits)
This course is designed to: (1) introduce the concepts and theories that are related to an increasingly important technology b (2) introduce various technologies or techniques for creating, analyzing, and disseminating GIS data and services via the Web. Students will be required to practice almost all of the Web GIS tools including client side mapping frameworks like the ArcGIS API for JavaScript, Mapbox, Leaflet, Google Map API, OpenLayers; server side systems including ArcGIS Enterprise (Server/Portal/DataStore), GeoServer; data formats for the web WMS, WFS, Feature Services, MapServices. Students will also be exposed to the experience of working with the Cloud environment such as AWS EC2 and Azure.
Recommended: GEOG676.
Restriction: Permission of BSOS-Geography department.

GEOG679 Seminar in Urban Geography (3 Credits)
Post-industrial urbanization; urban planning and management; metropolitan systems; internal structure of the city; use of techniques in urban locational research; transportation and land use.
Repeatable to: 6 credits if content differs.

GEOG680 GEOINT Networks (3 Credits)
Networks are an important part of the Geospatial Intelligence (GEOINT) cycle, from the sensor networks that are used to collect raw geospatial information to the telecommunication networks that are used to disseminate finished GEOINT products. Transportation networks, computer networks, social networks, and many other man-made and natural features can also be characterized by a link-node network topology, and can be studied using network science methods. Upon completion of this course you will be able characterize and classify real-world GEOINT networks and their components, understand network dynamics including routing, scalability, and robustness, and be able to apply engineering methods for network design and network analysis.

GEOG681 Introduction to Computational Social Science (3 Credits)
Introduction to Computational Social Science serves as an introduction to the basis for computational social science (CSS) across diverse disciplines and topics at the intersection of the socio-behavioral sciences, physical sciences, and computing sciences. We will explore the foundations for CSS in different subject domains, as the methods used to build representations of social science entities, phenomena, and processes in computational media. We will also critique applied computational social science as it relates to topics that cut across the socio-behavioral sciences, or that specialize within particular socio-behavioral science domains.
Credit Only Granted for: GEOG681 or GEOG788W.
Formerly: GEOG788W.

GEOG682 Open Source Intelligence (3 Credits)
Open Source Intelligence (OSINT) is information that is publicly available that is collected and analyzed to support decision-making. The collection and analysis of OSINT is often considered to be the first step in developing an all-source intelligence product, where OSINT is fused with Geospatial Intelligence (GEOINT), Signals Intelligence (SIGINT), and Measurement and Signature Intelligence (MASINT), and Human Intelligence (HUMINT). In this course you will learn about the sources, ethics, and methods that are associated with OSINT, and will also develop knowledge and skills related to open-source geospatial technologies and organizations such as the Open Geospatial Consortium (OGC).

GEOG683 Hazards and Emergency Management (3 Credits)
Timely and accurate Geospatial Intelligence (GEOINT) is essential for protecting people from hazardous events such as floods, wildfires, tsunamis, hurricanes, industrial accidents, and terrorist attacks. GEOINT plays a critical role in all four stages of emergency management: preparedness, mitigation, response, and recovery. The use of remote sensing and Geographic Information Systems (GIS) before, during, and after Hurricane Katrina and the 9/11 terror attacks are two of the case studies that are discussed during this course. You will develop a deeper understanding of the emergency management successes and failures that occurred during these historic and deadly events, and learn the technical skills to develop and disseminate GEOINT products that support decision-making at all four stages of emergency management.

GEOG685 Machine Learning and Data Mining (3 Credits)
Introduces statistical and spatial analysis over machine learning in mining data sets (and tackling big data problems), primarily in geography and spatial sciences, but with broader appeal throughout the socio-behavioral sciences. Students will be introduced to a range of methods that can be applied to the exploration, modeling, and visualization of big quantitative data. This course explores data cleaning, statistical analysis, and data-mining for geospatial and non-geospatial data in structured and unstructured form, with an emphasis on large silos of data across diverse sources and assumptions. Topics will include open sourcing, metadata schemes, data standards and models, data-access, data-mining, clustering methods, classifiers, data reduction, machine learning, filtering schemes, real-time and streaming data, archiving and preservation, and handling uncertainty.
Prerequisite: GEOG665 or equivalent.

GEOG686 Mobile GIS and Geocomputing (3 Credits)
An introduction to mobile GIS, to the programming concepts underlying mobile GIS development, and to the design and implementation of a mobile GIS application. Covers how to develop, test, and publish mobile GIS native apps working across two mobile platforms: Android and iOS. Leverages the capabilities of JavaScript, Swift, Google maps, ArcGIS Server and runtime SDK to developing and publishing mobile GIS apps.
Prerequisite: Permission of BSOS-Geography department; or must be enrolled in Geographical Sciences MPS or graduate certificate program.
Recommended: Students taking the course must be familiar with data structures, basic GIS concepts, and demonstrate basic understanding of object-oriented programming under GIS environment.
Credit Only Granted for: GEOG477, GEOG498V, GEOG788V or GEOG777.
Additional Information: Tablets that run android and iOS will be loaned to registered students at no cost.

GEOG687 Applied GEOINT- Regional Geostrategic Issues (3 Credits)
Applies a geospatial intelligence (GEOINT) lens when examining the political, military, economic and cultural effects of geography in historical and contemporary terms: specific emphasis is placed on the role of geography in the formulation of regional, e.g., Africa, military/political policy in land power, sea power, and air power. Comprehensive geopolitical theories will be incorporated with geospatial technologies as analytical tools in this course.

GEOG688 Selected Topics in GIS (1-3 Credits)
Readings and discussion on selected topics in the field of Geographic Information Science (GIS).
Repeatable to: 15 credits if content differs.

GEOG693 Independent Study in GEOINT (3 Credits)
In order to broaden the scope of the knowledge for our students in the ever-changing technologies in Geospatial Intelligence, the independent study course gives students an opportunity to explore a topic of interest under the close supervision of a faculty with expertise in the field. The course may include directed readings, applied work, assisting the faculty member with a research project, carrying out an independent research project, or other activities deemed appropriate by the supervising faculty member and the program.
Restriction: Permission of the Geospatial Intelligence program.

GEOG694 Computerized Map Projections and Transformations (3 Credits)
Computer generated projections; techniques for transforming one coordinate system to another; software for producing different map projections; mathematical and perceptual problems in producing and using projections.
Prerequisite: GEOG694; or students who have taken courses with comparable content may contact the department; or permission of BSOS-Geography department.

GEOG697 Capstone Project (3 Credits)
An independent research project that demonstrates competence in geospatial intelligence technologies. This project can originate from an internship, from relevant work at a current or past employer, or can be developed in conjunction with a department faculty. The student will prepare a project report and presentation which shall contain an executive summary, background information including a literature review and establishment of requirements, a detailed technical description of the project data and methods, a discussion of results obtained, and final conclusions and recommendations. The final project submission will include all data, computer code and/or workflow documentation required to replicate the project results. In completing this project, students develop a concrete example of how GEOINT technologies can be applied to solve real-world problems, and begin developing a portfolio that can be presented to potential employers.
Prerequisite: 24 credits in GEOG courses.
Restriction: Students taking the course must be familiar with data structures, basic GIS and RS concepts, and demonstrate basic understanding of using GIS and RS software. And must be enrolled in Geographical Sciences MPS or graduate certificate program; or permission of BSOS-Geography department.

GEOG698 Selected Topics in Geography (1-3 Credits)
Readings and discussion on selected topics in the field of geography.
Restriction: Permission of BSOS-Geography department.
Repeatable to: 12 credits if content differs.

GEOG699 Seminar in Computer Cartography (3 Credits)
Selected topics in computer-assisted cartography: algorithms for linear generalization, containing three-dimensional mapping and continuous-time mapping.
Prerequisite: GEOG373; or students who have taken courses with comparable content may contact the department; or permission of BSOS-Geography department.
Repeatable to: 6 credits if content differs.

GEOG718 Seminar in Integrative Studies (3 Credits)
Selected topics integrating various areas of study within the field of geography and/or related disciplines.
Restriction: Permission of BSOS-Geography department.
Repeatable to: 6 credits if content differs.

GEOG732 Spatial Econometrics (3 Credits)
An introduction to modern econometric techniques in general and spatial econometrics in particular, using the popular open source statistical computer language R. A focus on using statistical computing to produce analytical reports for real-world applications, research papers, and dissertations.
Prerequisite: Permission of BSOS-Geography department.
Jointly offered with: GEOG432.
Credit Only Granted for: GEOG432 or GEOG732.

GEOG738 Seminar in Human Geography (3 Credits)
Selected topics in human geography.
Restriction: Permission of BSOS-Geography department.
Repeatable to: 6 credits if content differs.

GEOG748 Seminar in Physical Geography (3 Credits)
Selected topics in physical geography.
Restriction: Permission of BSOS-Geography department.
Repeatable to: 6 credits if content differs.

GEOG749 Seminar in Biogeography (3 Credits)
Selected topics in biogeography.
Restriction: Permission of BSOS-Geography department.
Repeatable to: 6 credits if content differs.

GEOG761 Machine Learning for Computational Earth Observation Science (CEOS) (3 Credits)
Provides an introduction to machine learning methods and models with an emphasis on Earth observation. Topics will include supervised (decision trees, random forest, neural networks, support vector machine, Gaussian process and ensemble techniques), and unsupervised techniques (clustering/segmentation, dimension reduction, multi-dimensional data visualization). The course will highlight the state-of-the-art deep learning models; object-based versus pixel-based image classification; how to deal with missing data and non-uniform coverage of data; and large scale land cover land use mapping from heterogenous satellite data. Practical part will include satellite image classification by applying classification models and biophysical parameters retrieval by applying regression models.
Jointly offered with: GEOG461.
Credit Only Granted for: GEOG461, GEOG688M or GEOG761.
Formerly: GEOG688M.

GEOG770 Algorithms for Geospatial Computing (3 Credits)
Geometric primitives and algorithms for discrete and continuous spatial data processing. Point data representation and analysis: spatial data structures, neighbor finding and range queries, clustering algorithms. Terrain modeling: grids and TINs, algorithms and data structures for building and querying TINs, gridding and interpolation. Terrain analysis: segmentation through watershed computation, algorithms for visibility computation. Applications to LiDAR data processing and analysis for forest management, urban modeling, and coastal data mapping.
Prerequisite: GEOG276 or permission of instructor.
Jointly offered with: GEOG470.
Credit Only Granted for: CMSC498Q, CMSC401, CMSC788I, GEOG470, GEOG498I, GEOG770, or GEOG788I.
Formerly: GEOG788I.

GEOG778 Seminar in Remote Sensing (3 Credits)
Selected topics in remote sensing.
Restriction: Permission of BSOS-Geography department.
Repeatable to: 6 credits if content differs.

GEOG779 Seminar in Geographic Information Science (3 Credits)
Selected topics in geographic information science.
Restriction: Permission of BSOS-Geography department.
Repeatable to: 6 credits if content differs.

GEOG788 Selected Topics in Geography (1-3 Credits)
Readings and discussion on selected topics in the field of geography.
Restriction: Permission of BSOS-Geography department.
Repeatable to: 12 credits if content differs.

GEOG789 Independent Readings (1-8 Credits)
Independent reading as arranged between a graduate faculty member and graduate student.
Repeatable to: 8 credits if content differs.

GEOG790 Internship in Geography (3 Credits)
Field experience in the student's specialty in a Federal, state, or local agency or private business. Research paper required.

GEOG795 Professional Practices Seminar (1 Credit)
Development and preparation of a resume, selecting and helping reference writers, conducting successful interviews, negotiating an employment package, giving professional presentations, proposal prepartion, writing reports, codes of ethics and responsibilities. Presentations from practitioners in GIS field. Basic project management skills and strategies in preparation for professional project.
Restriction: Must be in Geospatial Information Sciences (Master's) program.

GEOG796 GIS Project Management (3 Credits)
Project management methodology is covered, emphasizing implementing and integrating GIS into broader projects. Topics include project initiation, planning, scope, scheduling, budgeting and risk management.
Prerequisite: GEOG653, GEOG652, and GEOG606.
Restriction: Must be in Geospatial Information Sciences (Master's) program; or must be in the Geospatial Information Sciences (Graduate Certificate) program.
Credit Only Granted for: GEOG796 or INFM706.
Formerly: INFM706.

GEOG797 Professional Project (3 Credits)
Data and materials can originate from an internship (internal or external) or from relevant work experience with current employer. Under direction of faculty advisor, students will prepare a project report containing explanation of the requirements for the work, technical account of the activities undertaken, including literature review, description of methods and approaches taken, a critical discussion of results, along with conclusions and recommendations developed from the project. Final project will consist of a full-fledged GIS application that is up and running and can be tested, providing potential employers with a portfolio demonstrating student's ability to manage and develop a GIS application in real world situations.
Restriction: Must be in Geospatial Information Sciences (Master's) program.

GEOG798 Selected Topics in Geography: Seminar Series (1 Credit)
Readings and discussions on selected topics in the field of geography.
Repeatable to: 6 credits if content differs.

GEOG799 Master's Thesis Research (1-6 Credits)

GEOG898 Pre-Candidacy Research (1-8 Credits)

GEOG899 Doctoral Dissertation Research (1-8 Credits)

GEOL - Geology

GEOL412 Geology of the Terrestrial Planets (3 Credits)
Geological features of Mercury, Venus, Mars and the Moon with an emphasis on results from recent NASA planetary mission. Topics include interior structure, impact cratering, tectonic and volcanic history, surface conditions, climate change, and habitability.
Prerequisite: GEOL341 or GEOL340.
Credit Only Granted for: GEOL489A or GEOL412.
Formerly: GEOL489A.

GEOL413 Geoscientific Modeling (3 Credits)
A model is a simplified representation of reality. Modeling is implicit or explicit in almost everything we do as geoscientists. Model construction, coding, and the concepts of parsimony vs complexity, robustness, validation, uncertainty, and the scientific interpretation of simulation results. Problem sets, independent study and participatory discussion of modeling applications in the current literature.
Prerequisite: MATH115; and two 400-level GEOL courses.
Recommended: Some experience in computer programming.
Jointly offered with: GEOL613.
Restriction: Non-degree-seeking students require the permission of the instructor.
Credit Only Granted for: GEOL413, GEOL489G, GEOL613 or GEOL789G.
Formerly: GEOL489G.

GEOL423 Optical Mineralogy (4 Credits)
The optical behavior of crystals with emphasis on the theory and application of the petrographic microscope.
Prerequisite: GEOL100 or GEOL120; and GEOL110; and GEOL322. And CHEM131 and CHEM132; or (CHEM135 and CHEM136); or CHEM103.
Restriction: Non-degree-seeking students require the permission of the instructor.

GEOL431 Vertebrate Paleobiology (4 Credits)
A survey of the evolution of the vertebrates, encompassing information from the diversity of living members, but concentrating on the contribution of the fossil record. Emphasis is on the phylogenetic systematics, comparative and functional anatomy, developmental biology, and stratigraphic distribution of major extinct and extant groups.
Prerequisite: BSCI207, BSCI392, GEOL104, GEOL204, or GEOL331; or permission of CMNS-Geology department.

GEOL435 Environmental Geochemistry (3 Credits)
An understanding of geochemical cycles of Earth's surface systems including soils, rivers, lakes, and estuaries and causes and implications of alteration of geochemical cycles. Topics include chemical weathering, soils, chemical composition of inland waters, hydrologic tracers, salinization, eutrophication, nutrient and metal pollution, and global geochemical cycles.
Prerequisite: MATH115; and (GEOL100 or GEOL120); and (GEOL436 or GEOL444). And CHEM131 and CHEM132; or (CHEM135 and CHEM136).
Restriction: Nondegree-seeking students require the permission of the instructor.
Credit Only Granted for: GEOL489W or GEOL435.
Formerly: GEOL489W.

GEOL436 Principles of Biogeochemistry (3 Credits)
An introduction to the basic principles of biogeochemistry including aspects of organic geochemistry, biochemistry, microbiology, global geochemical cycles, the origin of life and paleoenvironmental evolution.
Prerequisite: MATH120 or MATH140; or must have completed MATH220. And (GEOL100 or GEOL120); and GEOL322. And CHEM131 and CHEM132; or (CHEM135 and CHEM136).
Cross-listed with: AOSC436.
Restriction: Non-degree-seeking students require the permission of the instructor.
Credit Only Granted for: GEOL436 or AOSC436.

GEOL437 Global Climate Change: Past and Present (3 Credits)
Introduction to the processes by which climate varies, the paleoclimate record, and projections of climate change into the 21st century, including discussion of climate sensitivity to external radiative forcing.
Prerequisite: MATH115 or MATH140; and (GEOL100 or GEOL120); and (CHEM131 or CHEM135); and (CHEM132 or CHEM136).
Cross-listed with: AOSC437.
Jointly offered with: GEOL637, AOSC685.
Credit Only Granted for: GEOL437, GEOL637, AOSC437 or AOSC685.

GEOL443 Petrology (4 Credits)
Study of igneous and metamorphic rocks: petrogenesis, distributions, chemical and mineralogical relations, macroscopic and microscopic descriptions, geologic significance.
Prerequisite: GEOL322. And CHEM131 and CHEM132; or (CHEM135 and CHEM136); or CHEM103. And must have completed or be concurrently enrolled in GEOL423; and (GEOL100 or GEOL120); and GEOL110.
Corequisite: Permission of CMNS-Geology department.
Restriction: Non-degree-seeking students require the permission of the instructor.

GEOL444 Low Temperature Geochemistry (4 Credits)
Basic chemical principles, thermodynamics, and kinetics of low-temperature inorganic and organic geochemical reactions in a wide range of surface environments. These geochemical tools will be used to provide a context for understanding elemental cycling and climate change. Laboratories will include problem sets as well as wet chemical and mass spectrometric techniques used in low temperature geochemistry.
Prerequisite: GEOL322, GEOL100, and MATH115. And CHEM103; or (CHEM131 and CHEM132); or (CHEM135 and CHEM136).
Restriction: Non-degree-seeking students require the permission of the instructor.

GEOL445 High Temperature Geochemistry (4 Credits)
Review of chemical principles and their use in understanding processes of Earth, and solar system formation and differentiation. Topics include nucleosynthesis and cosmochemical abundances of elements, bonding and element partitioning, equilibrium thermodynamics and phase stabilities, radiogenic isotopes and geochronology, kinetics, and diffusion.
Prerequisite: GEOL322, GEOL100, and MATH115. And CHEM131 and CHEM132; or (CHEM135 and CHEM136); or CHEM103.
Restriction: Non-degree-seeking students require the permission of the instructor.

GEOL446 Geophysics (3 Credits)
An introduction to modern geophysics. Topics include: global plate tectonics, plate motion, triple junctions, geomagnetism, earthquakes and faulting, reflection and refraction seismology, gravity and isostasy, heat flow and mantle dynamics, deep interior of the Earth, geophysical observations and measurements.
Prerequisite: PHYS141, MATH141, and MATH140; and (GEOL100 or GEOL120).
Restriction: Non-degree-seeking students require the permission of the instructor.

GEOL447 Observational Geophysics (3 Credits)
An introduction to practical signal processing, data analysis, and inverse theory in geophysics.
Prerequisite: MATH140 and MATH141; and (PHYS141, PHYS161, or PHYS171).

GEOL451 Groundwater (3 Credits)
An introduction to the basic geologic parameters associated with the hydrologic cycle. Problems in the accumulation, distribution, and movement of groundwater will be analyzed.
Prerequisite: GEOL110 and MATH140; and (GEOL120 or GEOL100); and (CHEM131 and CHEM132; or (CHEM135 and CHEM136); or CHEM103). Or permission of CMNS-Geology department.
Restriction: Non-degree-seeking students require the permission of the instructor; and junior standing or higher.

GEOL452 Watershed and Wetland Hydrology (3 Credits)
Physical processes by which water moves in watershed and wetland systems. Topics include: precipitation, infiltration, flow in the unsaturated zone, streamflow generation processes, and groundwater flow.
Restriction: Junior standing or higher; and all other students require the permission of the instructor.

GEOL453 Ecosystem Restoration (3 Credits)
Overview of ecosystem functions across biomes/geologic settings, and considerations and tradeoffs in ecosystem restoration strategies. Specific case studies and discussions will be aimed at understanding how structure can influence biophysical and biogeochemical processes supporting ecosystems, and then describes how rates, timing, and location of physical, chemical, and ecosystem processes can be altered by different restoration strategies to enhance ecosystem services.
Prerequisite: MATH120 or MATH140; or must have completed MATH220. And (CHEM131 or CHEM135); and (CHEM132 or CHEM136); and (GEOL100, GEOL120, or ENST200).
Restriction: Junior standing or higher; and permission of instructor is required of non-degree-seeking students.
Credit Only Granted for: GEOL453 or GEOL489L.
Formerly: GEOL489L.

GEOL455 Marine Geophysics (3 Credits)
Plate tectonics, earthquakes and faulting, isostasy and gravity, heat and mantle dynamics, ocean ridges and transform faults, hydrothermal vents, trenches and oceanic islands, subduction zones, accretionary and erosion wedges, sedimentary basins and continental rifts. Exploration of the oceans using geophysical methods.
Prerequisite: MATH141 and MATH140; and (GEOL120 or GEOL100). Or permission of CMNS-Geology department.
Restriction: Non-degree-seeking students require the permission of the instructor.
Credit Only Granted for: GEOL455 or GEOL489E.
Formerly: GEOL489E.

GEOL456 Engineering Geology (3 Credits)
An overview of engineering geology with an emphasis on physical understanding of natural hazards and natural resources. General theories of stress and strain, failure criteria, frictional stability, fluid flow in porous media and poroelasticity are introduced. Quantitative approaches on earthquakes, landslides, land subsidence, and geotechnical aspects of oil/gas exploration are discussed.
Prerequisite: PHYS141 and MATH141; and (GEOL120 or GEOL100). Or permission of CMNS-Geology department.
Restriction: Non-degree-seeking students require the permission of the instructor.
Credit Only Granted for: GEOL456 or GEOL489Z.
Formerly: GEOL489Z.

GEOL457 Seismology (3 Credits)
General overview of the basics of seismology, starting with wave propagation, seismic reflection and refraction. Applications to the determination of the seismic velocity and anisotropy structure of the Earth. Earthquake generation, postseismic deformation and creep events, relation to faulting and plate tectonics.
Prerequisite: GEOL120 or GEOL100; and (MATH141, GEOL110, and MATH140). Or permission of CMNS-Geology department.
Recommended: PHYS171, PHYS141, or PHYS161.
Restriction: Non-degree-seeking students require the permission of the instructor.
Credit Only Granted for: GEOL457 or GEOL489A.
Formerly: GEOL489A.

GEOL460 Field Geophysics (4 Credits)
Students will become familiar with geophysical instrumentation used for both scientific and industrial applications. Students will be given an introduction to the use of geophysical instrumentation for data collection, processing, and analysis, design of field experiments for investigating field geophysical problems, and an introduction to the theory of instrument design and use. Instruments that will be covered include (but are not limited to): broadband seismometers, geophones, ground-penetrating radar, magnetotellurics, and Global Positioning Satellites.
Prerequisite: GEOL100 or GEOL120, MATH140, MATH141, and (PHYS141, PHYS161, or PHYS171).
Restriction: Non-degree-seeking students require the permission of the instructor.

GEOL463 Economic Geology (3 Credits)
The geological setting, and mineralogy of ore bodies, as well as the chemical and physical factors affecting the source, transport and deposition of metallic ores, petroleum and natural gas will be covered. The economics of mineral resources will be discussed.
Prerequisite: GEOL322; and (CHEM131 or CHEM135); and (CHEM132 or CHEM136).
Restriction: Non-degree-seeking students require the permission of the instructor.

GEOL471 Geochemical Methods of Analysis (3 Credits)
Principles and application of geochemical analysis as applied to a variety of geological problems. X-ray and optical spectroscopy, X-ray diffraction, atomic absorption, electron microprobe, and electron microscopy.
Prerequisite: CHEM131 and CHEM132; or (CHEM135 and CHEM136); or CHEM103.
Restriction: Non-degree-seeking students require the permission of the instructor.

GEOL472 Active Tectonics (3 Credits)
Provides overview of the theories, findings, and tools of Active Tectonics. The course is designed for graduate and senior undergraduate students who have basic mathematics background and have taken Structural Geology or relevant courses. Topics covered in this class include: stress and strain, crustal structure and lithosphere rheology, rock friction, geodesy, earthquake cycles, slow earthquakes, earthquake modeling, and earthquake hazards.
Prerequisite: GEOL341.
Recommended: GEOL340, GEOL447, GEOL457.
Restriction: Non-degree-seeking students require the permission of the instructor.

GEOL473 Origin and Evolution of the Continents (3 Credits)
Introduction to current theories regarding the origin and evolution of the continents. Emphasis on development of critical reading and reasoning skills, and improvement of verbal and written communication.
Prerequisite: GEOL445 and GEOL443; or permission of instructor.
Restriction: Non-degree-seeking students require the permission of the instructor.
Formerly: GEOL489I.

GEOL488 Geology Colloquium (1 Credit)
Contemporary research topics and issues in geosciences are explored through the weekly Geology departmental colloquium and discussion of its contents.
Prerequisite: At least one 300 or 400-level Geology course of at least 3 credits.
Restriction: May not be taken concurrently with GEOL497 or GEOL497H.
Repeatable to: 4 credits.

GEOL489 Special Topics (3 Credits)
Recent advances in geology.
Prerequisite: Must have completed at least 2 upper-level GEOL courses plus one additional GEOL course.
Corequisite: GEOL393.
Restriction: Must be in Geology program; and junior standing or higher.

GEOL490 Geology Field Camp (6 Credits)
Intense field geology course taught off campus during the summer. Students describe and compile maps of formations and structures from outcrops, subsurface, and remotely sensed data. Special fees required.
Prerequisite: GEOL341 and GEOL443.
Restriction: Non-degree-seeking students require the permission of the instructor.

GEOL491 Environmental Geology Field Camp (3-6 Credits)
Intensive field course designed for students of environmental geology. Students will learn to make maps, to describe soil profiles and site characteristics, to monitor hydrologic and groundwater conditions, and to measure geologic structures and stratigraphic sections.
Prerequisite: GEOL341, GEOL342, and GEOL451; or permission of CMNS-Geology department.
Restriction: Non-degree-seeking students require the permission of the instructor.
Credit Only Granted for: GEOL490 or GEOL491.

GEOL497 Recent Advances: Geology (3 Credits)
A survey of important recent advances in geological sciences in the context of the methods and practices of scientific research.
Prerequisite: Must have completed at least 2 upper-level GEOL courses.
Corequisite: GEOL393; and a third upper-level geology course.
Restriction: Must be in Geology program; and GPA of 3.0 or better in both overall and in all courses required for the major; and senior standing; and to be taken as late as possible in the program.
Credit Only Granted for: GEOL497 or GEOL489H.
Formerly: GEOL489H.

GEOL499 Special Problems in Geology (1-3 Credits)
Intensive study of a special geologic subject or technique selected after consultation with instructor. Intended to provide training or instruction not available in other courses which will aid the student's development in his or her field of major interest.
Prerequisite: (GEOL120 or GEOL100; and (GEOL102 and GEOL110)); or students who have taken courses with comparable content may contact the department. And permission of CMNS-Geology department.
Restriction: Non-degree-seeking students require the permission of the instructor.
Repeatable to: 15 credits if content differs.

GEOL612 Geology and Geophysics of the Terrestrial Planets (3 Credits)
Geological features of Mercury, Venus, Mars and the Moon with an emphasis on results from recent NASA planetary mission. Class is organized to follow geological processes or observation throughout the inner solar system. Topics covered include interior structure, impact cratering, tectonic and volcanic history, surface conditions and climate change.
Prerequisite: Permission of CMNS-Geology department; or (GEOL446 and MATH141).
Recommended: Familiarity with MATLAB or MATHEMATICA.
Credit Only Granted for: GEOL680 or GEOL789A.
Formerly: GEOL789A.

GEOL613 Geoscientific Modeling (3 Credits)
A model is a simplified representation of reality. Modeling is implicit or explicit in almost everything we do as geoscientists. Model construction, coding, and the concepts of parsimony vs complexity, robustness, validation, uncertainty, and the scientific interpretation of simulation results. Problem sets, independent study and participatory discussion of modeling applications in the current literature.
Prerequisite: Must have completed MATH115 or equivalent; and any two 400 level GEOL courses, or equivalent. Or permission of instructor.
Recommended: Some experience in computer programming will be helpful but not necessary.
Jointly offered with: GEOL413.
Restriction: Non-degree-seeking students require the permission of the instructor.
Credit Only Granted for: GEOL413, GEOL489G, GEOL613 or GEOL789G.
Formerly: GEOL789G.

GEOL614 Thermodynamics of Geological Processes (3 Credits)
Thermodynamics and its application to problems in mineralogy, petrology and geochemistry. Systematic development of the laws of thermodynamics and the principles of chemical equilibrium as applied to geological problems.
Prerequisite: PHYS142, GEOL322, and MATH141; and must have completed CHEM113.
Restriction: Non-degree-seeking students require the permission of the instructor.

GEOL615 Planetary Habitability and Surface Chemistry (3 Credits)
Introduction to emerging areas of research pertaining to the formation of planetary bodies, the evolution of habitable environments, and the capacity of life to emerge in environments found within and/or outside of our Solar System.
Prerequisite: GEOL445; or permission of instructor.
Credit Only Granted for: GEOL615 or GEOL789B.
Formerly: GEOL789B.

GEOL635 Environmental Geochemistry (3 Credits)
Geochemical cycles of Earth's surface systems including soils, rivers, lakes, and estuaries and causes; and implications of their alteration. Topics include chemical weathering, soils, chemistry of inland waters, hydrologic tracers, salinization, eutrophication, nutrient and metal pollution, and global geochemical cycles.
Prerequisite: MATH115; and (GEOL100 or GEOL120); and (GEOL436 or GEOL444). And CHEM131 and CHEM132; or (CHEM135 and CHEM136).
Restriction: Nondegree-seeking students require the permission of the instructor. Jointly offered with GEOL435.
Credit Only Granted for: GEOL635, GEOL789W, GEOL435 or GEOL489W.
Formerly: GEOL789W.

GEOL636 Ecosystem Restoration (3 Credits)
A further understanding of ecosystem functions across biomes/geologic settings, and developing practical applications in ecosystem restoration strategies through a graduate level project. Specific case studies and discussions will be aimed at understanding how structure can influence biophysical and biogeochemical processes supporting ecosystems, and then describes how rates, timing, and location of physical, chemical, and ecosystem processes can be altered by different restoration strategies to enhance ecosystem services. A project will then be used to apply restoration principles towards solving tangible environmental problems and communication to managers.
Prerequisite: MATH120 or MATH140; and (CHEM131 or CHEM135); and (CHEM132 or CHEM136); and (GEOL100, GEOL120, or ENST200).
Restriction: Equal preference is given to students enrolled in GEOL, MEES, CONS, ENST, AOSC, and civil and environmental engineering graduate programs; and permission of Instructor required for non degree seeking students.
Credit Only Granted for: GEOL453 or GEOL489L.
Formerly: GEOL489L.

GEOL637 Global Climate Change: Past and Present (3 Credits)
Introduction to the processes by which climate varies, the paleoclimate record, and projections of climate change into the 21st century, including discussion of climate sensitivity to external radiative forcing.
Prerequisite: MATH115 or equivalent; two 400 level GEOL courses or equivalent; or permission of the instructor.
Cross-listed with: AOSC685.
Jointly offered with: GEOL437, AOSC437.
Credit Only Granted for: GEOL437, GEOL637, AOSC437 or AOSC685.

GEOL647 Observational Geophysics (3 Credits)
Introduces graduate students to instrument design and performance, signal processing, data analysis and inverse theory in geophysics.
Prerequisite: MATH140, MATH141, and PHYS141; and (PHYS161 or PHYS171).
Credit Only Granted for: GEOL789O or GEOL647.
Formerly: GEOL789O.

GEOL650 Isotope and Trace Element Geochemistry (3 Credits)
Trace elements and isotopes in geology, including modern applications in geochronology and petrogenesis.
Prerequisite: GEOL443; or permission of CMNS-Geology department.
Restriction: Non-degree-seeking students require the permission of the instructor.

GEOL651 Statistics for Geoscientists (3 Credits)
Practical approach to basic statistics applied in the geosciences. Experimental design, elementary statistics and probability, sequence analysis, spatial analysis, linear regression, nonparametric statistics, bivariate, multivariate and principal components analysis of variance, hypothesis testing. Problem sets and participatory discussion of statistical applications in the current literature.
Prerequisite: MATH115; and non-degree-seeking students require the permission of the instructor.
Credit Only Granted for: GEOL789V or GEOL651.
Formerly: GEOL789V.

GEOL652 Advanced Watershed and Wetland Hydrology (3 Credits)
Physical and chemical processes in watershed and wetland systems: with an emphasis on redox reactions.
Prerequisite: GEOL452; or permission of CMNS-Geology department.
Restriction: Non-degree-seeking students require the permission of the instructor.

GEOL653 Advanced Problems in Economic Geology (3 Credits)
A systematic study of particular ore deposit types or areas of mineralization, primarily involving major economically important metals. Geologic setting, mineralogy and form and character of the ore bodies, chemical and physical factors affecting source, transport and deposition of ore forming fluids.
Prerequisite: GEOL453.
Restriction: Non-degree-seeking students require the permission of the instructor.

GEOL654 Fluvial Geomorphology Seminar (3 Credits)
Fluvial geomorphology is the study of the movement of water and sedimentin stream channels. This includes: formation of channels, open channel hydraulics, sediment transport or bedload and suspended load, river morphology and landscape evolution. The course is designed for graduate students and advanced undergraduates.
Recommended: GEOL452 and GEOL340.
Restriction: Non-degree-seeking students require the permission of the instructor.
Credit Only Granted for: GEOL654 or GEOL789B.
Formerly: GEOL789B.

GEOL655 Marine Geophysics (3 Credits)
An introduction to geophysical aspects of global tectonics. Quantitative geophysical approached are introduced for: past and present plate motions, seismology and interior of the Earth, gravity and isostasy, heat and mantle dynamics. Ocean ridges, hydrothermal vents, transform faults, oceanic core complex, ocean trenches and subduction zones, accretionary anderosion wedges, rift and rift margins, convergence and collisons, sedimentary basins.
Prerequisite: Permission of CMNS-Geology department.
Recommended: GEOL120 or GEOL100; and MATH141.
Restriction: Non-degree-seeking students require the permission of the instructor.
Credit Only Granted for: GEOL655 or GEOL789E.
Formerly: GEOL789E.

GEOL656 Engineering and Environmental Geology (3 Credits)
An overview of mechanical aspects of earthquakes as a result of fault instability. Quantitative approaches on soil and rock strength, instability on earthquakes, landslides, land subsidence, and geotechnical aspects of oil/gas exploration are discussed. Emphasis is on theoretical framework of mechanics of earthquake and faulting, earthquake source mechanisms, earthquake scaling relations, the seismic cycle etc.
Prerequisite: GEOL100, GEOL110, MATH141, and PHYS141; or permission of instructor.
Restriction: Non-degree-seeking students require the permission of the instructor.
Credit Only Granted for: GEOL656 or GEOL789Z.
Formerly: GEOL789Z.

GEOL657 Seismic Wave Propagation (3 Credits)
A description of the physics of seismic wave propagation and their applications to the determination of the structure of the Earth and the mechanics of earthquakes.
Prerequisite: MATH140 and MATH141; and (PHYS141, PHYS161, or PHYS171); and permission of CMNS-Geology department.
Recommended: GEOL100 or GEOL120; and (MATH241 and MATH246); and (PHYS260 or PHYS273).
Restriction: Non-degree-seeking students require the permission of the instructor.
Credit Only Granted for: GEOL657 or GEOL789A.
Formerly: GEOL789A.

GEOL670 Physical Oceanography (3 Credits)
Ocean observations. Water masses, sources of deep water. Mass, heat, and salt transport, geochemical tracers. Western boundary currents, maintenance of the thermocline. Coastal and estuarine processes. Surface waves and tides. Ocean climate.
Prerequisite: Permission of CMNS-Atmospheric & Oceanic Science department; or permission of CMNS-Geology department.
Cross-listed with: AOSC670.
Credit Only Granted for: GEOL670, AOSC670 or AOSC420.

GEOL671 Analytical Methods in Mineralogy (3 Credits)
An intensive study in the operation and application of instrumentation in mineralogical problems. Emphasis on designing and testing methods of analysis for use in the student's research problems in geology.
Prerequisite: CHEM471.
Restriction: Non-degree-seeking students require the permission of the instructor.

GEOL672 Tectonics (3 Credits)
The study of the development of the lithosphere on Earth and other rocky planets and moons. Emphasis on the student led discussion and improvement of scientific writing.
Prerequisite: GEOL341; or permission of CMNS-Geology department.
Restriction: Non-degree-seeking students require the permission of the instructor.
Credit Only Granted for: GEOL672 or GEOL789C.
Formerly: GEOL789C.

GEOL680 Geodynamics (3 Credits)
The mechanics and dynamics of the Earth's interior and their applications to problems of Geophysics. This course considers several rheological descriptions of Earth materials (brittle, elastic, linear and nonlinear fluids, and viscoelastic) and emphasizes analytical solutions to simplified problem.
Prerequisite: Permission of CMNS-Geology department; or (MATH241, MATH462, and GEOL446).
Recommended: Familiarity with MATLAB or MATHEMATICA.
Credit Only Granted for: GEOL680 or GEOL789J.
Formerly: GEOL789J.

GEOL681 Physics of Planetary Interiors and Surfaces (3 Credits)
Formation of planets in the solar system; segregation and core formation in terrestrial planets; formation of early atmosphere; tectonics and volcanism; geochemical and cosmochemical constraints; planetary geomorphology.
Prerequisite: Advanced undergraduate geophysics, astronomy or geochemistry; and GEOL446. Or permission of CMNS-Geology department.
Credit Only Granted for: GEOL681 or GEOL789X.
Formerly: GEOL789X.

GEOL682 Computational Geodynamics (3 Credits)
An introduction to the techniques used to model geodynamics processes. The focus is on understanding and applying techniques, not on proving their worth and programming. Students will learn about Finite Element, Boundary Elements, and Finite Differences methods. We will not explore these topics with the rigor expected by Applied Mathematics but focus instead on practical aspects and their application to geodynamics.
Prerequisite: Permission of CMNS-Geology department; or (MATH462, GEOL680, and MATH240).
Recommended: Familiarity with MATLAB.
Credit Only Granted for: GEOL682 or GEOL789M.
Formerly: GEOL789M.

GEOL683 Cosmochemistry (3 Credits)
Introduction to current theories behind the origin, age and evolution of our solar system. The primary focus will be on the interpretation of petrologic, chemical and isotopic data obtained from meteorites, and planetary materials collected by sample return missions to the Moon and asteroids. Includes in-depth discussion of the mechanisms of formation of the asteroids and planets and the origin of the Moon and Mars. Includes hands-on examination of lunar samples from the Apollo missions as well as various types of meteorites.
Recommended: GEOL650.
Credit Only Granted for: GEOL683 or GEOL789K.
Formerly: GEOL789K.

GEOL688 Geology Colloquium (1 Credit)
Contemporary research topics and issues in geosciences are explored through the weekly Geology departmental colloquium and discussion of its contents.
Restriction: Restricted to graduate students in Geology who have not yet advanced to PhD candidacy. Repeatable for credit with changing content. May not be taken for credit concurrently with GEOL497 or GEOL497H.
Repeatable to: 4 credits.

GEOL690 Geoscience Communications (3 Credits)
Explores the style and logic of scientific writing including abstracts, articles, and proposals, as well as the preparation of clear and concise presentations, in order to enhance the quality of scientific communication and hasten the pace of successful publications.
Credit Only Granted for: GEOL690, GEOL789R, or GEOL789S.
Formerly: GEOL789R and GEOL789S.

GEOL789 Recent Advances in Geology (2-4 Credits)
Recent advances in geology research.

GEOL798 Seminar in Geology (1-3 Credits)
Discussion of special topics in current literature in all phases of geology.
Repeatable to: 9 credits if content differs.

GEOL799 Master's Thesis Research (1-6 Credits)

GEOL898 Pre-Candidacy Research (1-8 Credits)

GEOL899 Doctoral Dissertation Research (1-8 Credits)

GERS - German Studies

GERS402 Advanced Conversation and Composition (3 Credits)
Advanced instruction in and acquisition of written and oral communication skills in German
Prerequisite: GERS302; or students who have taken courses with comparable content may contact the department.
Restriction: Must not have completed GERS401 or GERS403.
Credit Only Granted for: (GERM401 and GERM403), GERM402, or GERS402.
Formerly: GERM402.

GERS411 German for International Business I (3 Credits)
Advanced skills in German for international business, including understanding and writing correspondence, reports, graphics, ads, etc., according to current German commercial style.
Credit Only Granted for: GERM411 or GERS411.
Formerly: GERM411.

GERS415 German/English Translation I (3 Credits)
An intensive presentation of German grammar limited exclusively to reading skill; graded readings in the arts and sciences. Instruction in English; cannot be used to satisfy the arts and humanities foreign language requirement.
Restriction: Must not have completed GERS103, GERS203, GERS204, GERS301, or GERS302.

GERS419 Selected Topics in German Language Studies (3 Credits)
The analysis of the German language as a reflection of cultural, functional, and social practice in the German-speaking world.
Prerequisite: GERS302; and permission of ARHU-School of Languages, Literatures, and Cultures department.
Repeatable to: 6 credits if content differs.
Credit Only Granted for: GERM419 or GERS419.
Formerly: GERM419.

GERS436 The Usual Suspects: Criminals in German Literature and Film (3 Credits)
An examination of how historical, cultural and political discourses in German-speaking countries influence social norms and criteria for judging what is considered socially acceptable or "deviant". Texts and films span from the 18th to 21st centuries. Taught in German.
Prerequisite: GERS320 or GERS322; or permission of instructor.
Credit Only Granted for: GERM436 or GERS436.
Formerly: GERM436.

GERS439 Selected Topics in German Literature (3 Credits)
Special study of an author, school, genre, or theme. Taught in German.
Prerequisite: GERS320, GERS321, or GERS322; or permission of ARHU-School of Languages, Literatures, and Cultures department.
Repeatable to: 6 credits if content differs.
Formerly: GERM439.

GERS441 Border Crossings and Cultural Transfers (3 Credits)
Border Crossings and Cultural Transfers emphasizes the transnational and global dimensions of German culture, analyzing the interrelationship of dominant and minority cultures within Germany and/or the impact of German cultures abroad. Topics include migration, exile, (post)colonialism, and globalization. Taught in German.
Prerequisite: GERS320 or GERS322.
Credit Only Granted for: GERM441 or GERS441.
Formerly: GERM441.

GERS442 Gender and Sexuality in German Literature and Society (3 Credits)
Gender and Sexuality in German Literature and Society analyzes gender and sexuality as key discourses for understanding German-speaking literatures, cultures, and societies. Topics include the history of sexuality; death and desire; and representations of gender in German literature. Taught in German.
Prerequisite: GERS320 or GERS322.
Credit Only Granted for: GERM442 or GERS442.
Formerly: GERM442.

GERS443 Literature as Cultural Discourse (3 Credits)
Investigates literature as cultural discourse in the construction of knowledge, emphasizing a discursive approach to analyzing a range of literary texts. Taught in German.
Prerequisite: GERS320 or GERS322.

GERS444 The German-Jewish Experience (3 Credits)
Focuses on the German-Jewish experience as a key dimension of European history, literature, and culture. Topics include Heinrich Heine, German-Jewish authors and texts, and the Holocaust in literature and film.
Prerequisite: GERS320 or GERS322.
Credit Only Granted for: GERM444 or GERS444.
Formerly: GERM444.
Additional Information: Taught in German.

GERS449 Selected Topics in German Studies (3 Credits)
Study of a linguistic, literary or cultural topic in Yiddish, Netherlandic, or Scandinavian studies.
Prerequisite: Permission of ARHU-School of Languages, Literatures, and Cultures department.
Repeatable to: 6 credits if content differs.
Formerly: GERM449.

GERS457 Germany: Energy Transition, Climate Change, and Sustainability (3 Credits)
Interdisciplinary examination of Germany as a leading model in dealing with contemporary issues of sustainability as well as the economic, social, and political impacts of climate change in a global world. Students will learn the basics of climate change, examine policy tools (e.g. carbon taxes, regulations, incentives, etc.) and technological innovations to curb the causes of climate change and promote sustainable practices. Students will also learn how cultural values and traditions inform policy making by examining the history of the environmental movement in German cultural artifacts (e.g., art, literature, grass-roots social movements, etc.). Designed to appeal to students with a variety of backgrounds (technical, policy and government, and humanities), the course blends site visits (e.g. coal mines, government offices, technical universities, artist studios, grass-roots collectives, museums, parks, etc.) with academic lectures by experts in pertinent fields and faculty-led discussion groups. Students will receive an overarching and holistic overview of the economic, political, and cultural costs of climate change as well as current efforts to offset the negative impacts through greater sustainability. Taught in English.
Cross-listed with: AREC357.
Credit Only Granted for: AREC357 or GERS457.

GERS458 Literary or Media Genres (3 Credits)
Literary or Media Genres studies the formal and stylistic dimensions of specific genres, emphasizing genre as a social, political, and aesthetic category. Topics include pop literature; the history of German drama; and German film genres among others.
Prerequisite: GERS320 or GERS322.
Repeatable to: 6 credits if content differs.
Formerly: GERM458.
Additional Information: Taught in German.

GERS473 Variation in Contemporary German Language (3 Credits)
Examines the unique, multilingual society that is modern Germany, exploring issues such as regional varieties, gendered language, language reform (and resistance to it), public and media speech, the influence of American English on colloquial speech and in specific fields, and the problems of immigrant communities acquiring both dialect and standard German.
Prerequisite: GERS302; or permission of instructor.
Credit Only Granted for: GERM473, GERS473, GERM673, or GERS673.
Formerly: GERM473.

GERS489 Social Issues in German Culture (3 Credits)
Special topics course examining the cultural constructions and representations of important social, political, and linguistic issues, investigating their connection to German values and institutions. Taught in German.
Prerequisite: GERS320 or GERS322.
Repeatable to: 6 credits if content differs.
Formerly: GERM489.

GERS498 Honors Thesis Writing (3 Credits)
Required for students pursuing departmental honors in German languages and literatures. Under the direction of a German department faculty member, students write their honors theses.
Restriction: Permission of ARHU-School of Languages, Literatures, and Cultures department.
Repeatable to: 6 credits if content differs.
Formerly: GERM498.

GERS499 Directed Study (1-3 Credits)
Student-driven, independent study of a specialized topic in coordination with a faculty advisor.
Restriction: Permission of ARHU-School of Languages, Literatures, and Cultures department.
Repeatable to: 6 credits if content differs.
Formerly: GERM499.

GERS618 College Teaching of German (1 Credit)
Instruction, demonstration and classroom practice under supervision of modern procedures in the presentation of elementary German courses to college age students.
Repeatable to: 3 credits.
Formerly: GERM618.

GERS673 Variation in Contemporary German (3 Credits)
Examines the unique, multilingual society that is modern Germany, exploring issues such as regional varieties, gendered language, language reform (and resistance to it), public and media speech, the influence of American English on colloquial speech and in specific fields, and the problems of immigrant communities acquiring both dialect and standard German. This may count for the upper-division requirement of the German major.
Jointly offered with: GERS473.
Credit Only Granted for: GERM673, GERS673, GERM473, or GERS473.
Formerly: GERM673.

GERS689 Special Topics - M.A. Level (1-3 Credits)
M.A.-level study of a literary, linguistic or cultural topic in German studies.
Repeatable to: 6 credits if content differs.
Formerly: GERM689.

GERS699 Colloquium in German Studies (3 Credits)
Sustained instruction and practice in academic research skills, including strategies for effective argumentation, synthesizing and incorporating peer feedback, critically assessing and utilizing scholarly works, and presentation of research.
Repeatable to: 6 credits.

GERS798 Master's Independent Study (1-3 Credits)
German Studies master's independent study.
Restriction: Permission of instructor.
Repeatable to: 6 credits if content differs.
Formerly: GERM798.

GERS799 Master's Thesis Research (1-6 Credits)
German Studies master's thesis research.
Formerly: GERM799.

GERS839 Seminar: Special Topics (3 Credits)
Study of a topic of a general nature and not limited to any specific century.
Repeatable to: 9 credits if content differs.
Formerly: GERM839.

GERS879 Seminar in Germanic Philology (3 Credits)
In depth study of a topic in Germanic or Indo-European philology comparative Germanic grammar, runology, dialect geography, Eddic or Skaldic poetry, Indo-European studies.
Repeatable to: 9 credits if content differs.
Formerly: GERM879.

GERS888 Doctoral Independent Study (1-3 Credits)
German Studies doctoral independent study.
Restriction: Permission of instructor.
Repeatable to: 6 credits if content differs.
Formerly: GERM888.

GERS889 Seminar in German Studies (3 Credits)
Comprehensive study of a selected topic in German Studies: history of ideas, cultural history, German literature and media.
Repeatable to: 9 credits if content differs.

GERS898 Pre-Candidacy Research (1-8 Credits)
German Studies pre-candidacy research.
Restriction: Permission of instructor.
Repeatable to: 6 credits if content differs.
Formerly: GERM898.

GERS899 Doctoral Dissertation Research (1-8 Credits)
German Studies dissertation research.
Formerly: GERM899.

GREK - Greek

GREK401 Intermediate Ancient Greek (4 Credits)
The third and last part of the introductory sequence to ancient Greek, the language shared by Homer, Aristophanes, Aristotle, Hippocrates, Ptolemy, Archimedes, Euclid, and Paul the Apostle, among many others whose ideas and influence have shaped our world. Students will conclude their review of the major points of grammar. strengthen their reading comprehension with select texts of Classical and New Testament (Koine) Greek, and learn about basic aspects of Athenian life and culture in the fifth century BC.
Jointly offered with: GREK201.
Restriction: Restricted to Graduate Students.
Additional Information: This course is restricted to Graduate Students; please consult with the DGS of Classics. Undergraduates who wish to study intermediate Greek should register for GREK201.

GREK411 Modern Greek Literature and History (3 Credits)
Students will study historical and political events in Greece during the 19th and 20th centuries through the viewpoint of the man of letters. Poetry, prose, plays, and essays reflect national emancipation, social reconstruction, and political struggles. Readings and discussion are in Modern Greek.
Prerequisite: Students must have earned a grade of C- or better in a 300-level Modern Greek course.
Restriction: Permission of instructor.
Credit Only Granted for: GREK311 or GREK411.
Formerly: GREK311.

GREK415 Homer (3 Credits)
Extensive readings in Greek from the Iliad or the Odyssey, with special attention to the features of Homeric style and the relationship between the two epics.
Prerequisite: Permission of ARHU-Classics department.

GREK472 History and Development of the Greek Language (3 Credits)
Mastery of ancient Greek through grammar review, prose composition, and analysis of historical developments in Greek writers' modes of expression.
Restriction: Permission of instructor.

GREK488 Greek Readings (3 Credits)
The reading of one or more selected Greek authors. Reports.
Prerequisite: Permission of ARHU-Classics department.
Repeatable to: 6 credits if content differs.
Additional Information: Readings are in ancient Greek.

GREK499 Independent Study in Greek Language and Literature (1-3 Credits)
Prerequisite: Permission of ARHU-Classics department.
Repeatable to: 6 credits if content differs.

GREK604 Homer (3 Credits)
The extensive and intensive reading of Homer, with concentration on one of his two epics. Discussion of the language, artistic qualities, and thought of the poems, and of modern views concerning their orgin and literary qualities.

GREK606 Greek Historians (3 Credits)
Survey of the Greek historians, concentrating on Herodotus and Thucydides, contrasting the two historians in the areas of subject, methods of research, composition, and achievement.

GREK672 History and Development of the Greek Language (3 Credits)
Mastery of ancient Greek through grammar review, prose composition, and analysis of historical developments in Greek writers' modes of expression.
Restriction: Permission of instructor.

GREK688 Special Topics in Greek Literature (3 Credits)
Repeatable to: 9 credits if content differs.

GREK699 Independent Study in Greek Literature (1-3 Credits)
Prerequisite: Permission of ARHU-Classics department.
Repeatable to: 6 credits if content differs.

GREK799 Master's Thesis Research (1-6 Credits)

GVPT - Government and Politics

GVPT402 International Law (3 Credits)
A study of the basic character, general principles and specific rules of international law, with emphasis on recent and contemporary trends in the field and its relation to other aspects of international affairs.
Prerequisite: GVPT200.
Restriction: Must be in Government & Politics program; and junior standing or higher.

GVPT404 Political Economy of Foreign Aid (3 Credits)
The world spends hundreds of billions of dollars on foreign aid every year. The effects of this aid spending are controversial. Research supports both pessimistic and optimistic views of foreign aid's effectiveness, with little consensus. Where does aid money go? What are the motivations of aid donors? Is foreign aid effective at achieving its goals? Why or why not? This course is designed to survey the promise and the challenges of foreign aid as a policy tool. The first half of the course will focus on the motivations and goals of foreign aid. We will consider various foreign aid donors, such as countries, institutions, and individuals, to understand the motivations behind and effects of foreign aid. We will create a typology of foreign aid agendas, motivations, and donors. The second half of the course will consider the challenges specific to foreign aid. This includes both technical challenges and political challenges. We will consider the strategies that aid donors and organizations have taken to try to overcome these challenges.
Recommended: GVPT200.
Restriction: Must be in Government & Politics or Government & Politics: International Relations program.
Credit Only Granted for: GVPT409R or GVPT404.
Formerly: GVPT409R.

GVPT406 International Organizations (3 Credits)
A basic introduction to the full range of international organizations that have come into being over the past century and one-half, including those that aspire to be universal or global, those with a geopolitical or regional focus, and those that address specific structural or functional areas of human endeavor or issue areas.
Prerequisite: GVPT200.
Restriction: Must be in Government & Politics program; and junior standing or higher. Or must be in Government & Politics: International Relations program; and junior standing or higher.

GVPT407 International Political Economy (3 Credits)
Introduces the field of international political economy, which analyzes the ways in which economic and political changes produce both economic and political reactions.
Prerequisite: GVPT200.
Restriction: Must be in Government & Politics program; and junior standing or higher.

GVPT409 Seminar in International Relations and World Politics (3 Credits)
Reading, writing, and research on topics in international relations and world politics. Both substantive issues and methodological approaches will be considered.
Prerequisite: GVPT200.
Restriction: Must be in one of the following programs (Government & Politics; Government & Politics: International Relations) ; and junior standing or higher.
Repeatable to: 9 credits if content differs.

GVPT410 Politics of Nationalist and Ethnic Conflict (3 Credits)
An examination of the major causes and consequences of ethnic, nationalist, and separatist conflict. The course will focus on both theories of ethnicity and nationalism, as well as theories of conflict related to these issues. The course will also explore empirical trends in ethnic and nationalist politics.
Prerequisite: GVPT200.
Restriction: Must be in one of the following programs (Government & Politics; Government & Politics: International Relations).
Credit Only Granted for: GVPT409M or GVPT410.
Formerly: GVPT409M.

GVPT411 Conflict in the International System (3 Credits)
In this course, we will examine conflict, peace, and conflict resolution in contemporary international politics. We will interrogate what we mean by concepts such as peace, conflict, and violence, the different forms that these phenomena can take, and how we can measure their occurrence. We will discuss theoretical explanations for why individuals and groups have disputes, why these actors choose to use violence (or not) in these disputes, and ways in which violent disputes can be resolved peacefully. We will examine these arguments in a detailed study of conflicts in the Middle East, as well as by evaluating published articles that examine the effectiveness of conflict management strategies such as peacekeeping.
Prerequisite: GVPT200.
Restriction: Must be in Government & Politics or Government & Politics: International Relations program.
Credit Only Granted for: GVPT409P or GVPT411.
Formerly: GVPT409P.

GVPT413 Peace, Justice, and Conflict Resolution (3 Credits)
An examination of classic and contemporary perspectives on peace, justice, and conflict resolution after armed conflict. The goal of this course is to expose students to the advantages, risks, and challenges of the most prominent methods of conflict mitigation and resolution, including mediation and arbitration; peacekeeping, peacemaking, and peacebuilding; the protection of civilians, Responsibility to Protect, and humanitarian assistance; elections, democratization, and power-sharing; and transitional reconciliation and justice. We will do this by reading, discussing, and synthesizing classic and cutting-edge Political Science research on these topics.
Recommended: GVPT200.
Restriction: Must be in Government & Politics or Government & Politics: International Relations program.
Credit Only Granted for: GVPT409A or GVPT413.
Formerly: GVPT409A.

GVPT414 International Relations of East Asia (3 Credits)
An examination of international relations in East Asia, focusing mostly on Northeast Asia. The course will provide some background on the evolution of international politics in the region over the past several decades, and will examine several contemporary issues--including the North Korean nuclear issue, the relationship across the Taiwan Strait, and maritime disputes in the East and South China Seas--in depth.
Prerequisite: GVPT200.
Restriction: Must be in Government & Politics or Government & Politics: International Relations program.
Credit Only Granted for: GVPT409E or GVPT414.
Formerly: GVPT409E.

GVPT417 Seminar in Advanced Topics in Environmental Policy Analysis (3 Credits)
A series of critical tools and methods used to analyze environmental policy. This class should be of interest to students who are either considering a career or graduate studies in environmental protection.
Prerequisite: GVPT273.
Restriction: Must be in one of the following programs (Government & Politics; Environmental Sci&Policy-Env Politics & Policy).
Credit Only Granted for: GVPT419B or GVPT417.
Formerly: GVPT419B.

GVPT419 Seminar in Public Policy (3 Credits)
Reading, writing, and research on topics in public policy. Both substantive issues and methodological approaches will be considered.
Prerequisite: GVPT241 and GVPT170.
Recommended: GVPT270.
Restriction: Must be in Government & Politics program.
Repeatable to: 6 credits if content differs.

GVPT420 The Logic and Practice of Measuring Political Behavior (3 Credits)
Introduction to concepts and practices used for measuring political behavior. Political analysis is an increasingly quantitative field. It is crucial for students of political behavior to learn how to define concepts in concrete ways, examine different methods of measuring concepts, learn how to test the quality of chosen measures, learn how to construct richer measures out of multiple questions, and finally how to examine the relationship between multiple measures of similar concepts. Common pitfalls, errors, bias, and ethics will be examined along the way.
Prerequisite: GVPT201.
Restriction: Must be in Government & Politics program; or must be in Government & Politics: International Relations program.

GVPT421 Advanced Quantitative Methods (3 Credits)
Advanced quantitative methods for political science research.
Prerequisite: GVPT201.
Restriction: Must be in one of the following programs (Government & Politics; Government & Politics: International Relations).

GVPT422 Quantitative Political Analysis (3 Credits)
Introduction to quantitative methods of data analysis, including selected statistical methods, block analysis, content analysis, and scale construction.
Prerequisite: GVPT241 and GVPT170.
Recommended: GVPT220.
Restriction: Must be in Government & Politics program.

GVPT423 Elections and Electoral Behavior (3 Credits)
An examination of various topics relating to elections; the focus includes the legal structure under which elections are conducted, the selection and nomination process, the conduct of election campaigns, and patterns of political participation and voting choice in different types of elections.
Prerequisite: GVPT241 and GVPT170.
Restriction: Must be in Government & Politics program.

GVPT424 Quantitative Study of International Relations (3 Credits)
A comprehensive introduction to the quantitative study of international conflict. Students will perform statistical analysis of international conflict data using the R software platform.
Prerequisite: GVPT201.
Restriction: Must be in one of the following programs (Government & Politics; Government & Politics: International Relations).
Credit Only Granted for: GVPT409H (Fall 2015 and Fall 2016) or GVPT424.
Formerly: GVPT409H (Fall 2015 and Fall 2016).

GVPT428 Topics in Formal Theories of Political Behavior and Politics (3 Credits)
An evaluation of theories of political behavior such as game, social choice and voting theory, and their applications to problems of distribution and social justice, community organizing, responsive public policy, institutional design, and alliance and coalition formation.
Prerequisite: GVPT241 and GVPT221.
Restriction: Must be in Government & Politics program.
Repeatable to: 6 credits if content differs.

GVPT429 Problems in Political Behavior (3 Credits)
The problem approach to political behavior with emphasis on theoretical and empirical studies on selected aspects of the political process.
Prerequisite: GVPT241.
Recommended: GVPT220.
Restriction: Must be in Government & Politics program.

GVPT431 Introduction to Constitutional Law (3 Credits)
A systematic inquiry into the general principles of the American constitutional system, with special reference to the role of the judiciary in the interpretation and enforcement of the federal constitution.
Prerequisite: GVPT170 and GVPT331.
Restriction: Must be in one of the following programs (Government & Politics; Government & Politics: International Relations) ; and junior standing or higher.

GVPT432 Civil Rights and the Constitution (3 Credits)
A study of civil rights in the American constitutional context, emphasizing freedom of religion, freedom of expression, minority discrimination, and the rights of defendants.
Prerequisite: GVPT170 and GVPT331.
Restriction: Must be in one of the following programs (Government & Politics; Government & Politics: International Relations).

GVPT439 Seminar in Public Law (3 Credits)
Reading, writing, and research on topics in public law. Both substantive issues and methodological approaches will be considered.
Prerequisite: GVPT241 and GVPT170.
Recommended: GVPT331.
Restriction: Must be in Government & Politics program; and junior standing or higher.
Repeatable to: 6 credits if content differs.

GVPT442 History of Political Theory--Medieval to Recent (3 Credits)
A survey of the principal theories set forth in the works of writers from Machiavelli to Nietzsche.
Prerequisite: GVPT241.
Restriction: Must be in Government & Politics program.

GVPT443 Contemporary Political Theory (3 Credits)
A survey of the principal political theories and ideologies set forth in the works of writers from Karl Marx to the present.
Prerequisite: GVPT241.
Restriction: Must be in Government & Politics program.

GVPT445 Marxism and Postmarxism (3 Credits)
The study of Marxist thought and an assessment of the critical transformations and reassessments of the theory and practice of Marxism.
Restriction: Must be in a major within BSOS-Government & Politics department.

GVPT448 Non-Western Political Thought (3 Credits)
Examination of works by major authors and general themes of political thought originating in Asia, the Middle East, and Africa. This is not a survey of all non-Western political thought, but a course to be limited by the professor with each offering.
Prerequisite: GVPT241.
Restriction: Must be in Government & Politics program.
Additional Information: Permission of department required for repeat.

GVPT449 Seminar in Political Philosophy (3 Credits)
Reading, writing, and research on topics in political philosophy. Both substantive issues and methodological approaches will be considered.
Prerequisite: GVPT241.
Restriction: Must be in Government & Politics program.
Repeatable to: 6 credits if content differs.

GVPT454 Seminar in the International Relations of China (3 Credits)
Explores the foreign relations behavior of the People's Republic of China, with focus on the contemporary era.
Prerequisite: GVPT200.
Restriction: Must be in Government & Politics program; and junior standing or higher. Or must be in Government & Politics: International Relations program; and junior standing or higher.

GVPT456 The Politics of Terrorism (3 Credits)
Examination of the definition, causes and organization of terrorist activity, along with key domestic and international counter- and anti-terrorism responses. Special emphasis on challanges and opportunities to the scientific study of terrorism.
Prerequisite: GVPT200.
Restriction: Must be in Government & Politics program; or must be in Government & Politics: International Relations program.
Credit Only Granted for: GVPT456 or GVPT459T.
Formerly: GVPT459T.

GVPT457 American Foreign Relations (3 Credits)
The principles and machinery of the conduct of American foreign relations and an analysis of the major foreign policies of the United States.
Prerequisite: GVPT200.
Restriction: Must be in Government & Politics program; and junior standing or higher.

GVPT458 Special Topics in Study Abroad IV (1-6 Credits)
Special topics course taken as part of an approved study abroad program.
Repeatable to: 15 credits if content differs.

GVPT459 Seminar in Comparative Politics (3 Credits)
Reading, writing, and research on topics in comparative politics. Both substantive issues and methodological approaches will be considered.
Prerequisite: GVPT200; and (GVPT282 or GVPT280).
Restriction: Must be in Government & Politics program; or must be in Government & Politics: International Relations program.
Repeatable to: 6 credits if content differs.

GVPT460 State Politics and Government (3 Credits)
A study of the structure, procedures and policies of state governments with special emphasis on intergovernmental relationships, and with illustrations from Maryland governmental arrangements.
Prerequisite: GVPT241 and GVPT170.
Recommended: GVPT260.
Restriction: Must be in Government & Politics program; or must be in Government & Politics: International Relations program.

GVPT461 Local Politics and Government (3 Credits)
An introduction to local government and politics in the U.S. context. The course explores the evolution of local jurisdictions, particularly cities, and the politics of local level decision making.
Prerequisite: GVPT170.
Restriction: Must be in Government & Politics program; or must be in Government & Politics: International Relations program.
Credit Only Granted for: GVPT461 or GVPT479L.
Formerly: GVPT479L.

GVPT473 The U.S. Congress (3 Credits)
A detailed survey of lawmaking and the legislative process, emphasizing the U.S. Congress, and its members.
Prerequisite: GVPT241 and GVPT170.
Restriction: Junior standing or higher. And must be in Government & Politics program; or must be in Government & Politics: International Relations program.

GVPT474 Political Parties (3 Credits)
A descriptive and analytical examination of American political parties, nominations, elections, and political leadership.
Prerequisite: GVPT241 and GVPT170.
Restriction: Must be in Government & Politics program.

GVPT475 The Presidency and the Executive Branch (3 Credits)
An examination of the U.S. presidency in historical and contemporary perspective: nomination and electoral politics and the president's place in policy-making, administration, and public opinion.
Prerequisite: GVPT241 and GVPT170.
Restriction: Must be in Government & Politics program; and junior standing or higher.

GVPT476 The Business Government Relationship (3 Credits)
Examines the structures, process, and outcomes of business and government and the politics and products of their cooperative-adversarial relationships in the United States. The design integrates interest group and administrative politics and the public policy process.
Prerequisite: GVPT241 and GVPT170.
Recommended: GVPT270.
Restriction: Must be in Government & Politics program.

GVPT477 Voting and Participation (3 Credits)
A study of the factors that influence individual vote choice and voter participation in the U.S. The course will introduce political science research pertaining to both topics and will engage current controversies over such things as political campaign laws and the various state and federal rules that govern election administration.
Prerequisite: GVPT170 and GVPT241.
Restriction: Must be in Government & Politics program.

GVPT479 Seminar in American Politics (3 Credits)
Reading, writing, and research on topics in American politics. Both substantive issues and methodological approaches will be considered.
Prerequisite: GVPT241 and GVPT170.
Restriction: Must be in Government & Politics program; and junior standing or higher.
Repeatable to: 6 credits if content differs.

GVPT481 Government and Administration of Russia and the States of the Former Soviet Union (3 Credits)
A comparative study of the governmental systems and political processes of the states of the former Soviet Union.
Prerequisite: GVPT200; and (GVPT282 or GVPT280).
Restriction: Must be in Government & Politics program.

GVPT482 Government and Politics of Latin America (3 Credits)
A comparative study of the governmental systems and political processes of the Latin American countries.
Restriction: Must be in Government & Politics program; or must be in Government & Politics: International Relations program.

GVPT484 Government and Politics of Africa (3 Credits)
A comparative study of the governmental systems and political processes of the African countries, with special emphasis on the problems of nation-building in emergent countries.
Prerequisite: GVPT282 or GVPT280.
Restriction: Must be in one of the following programs (Government & Politics; Government & Politics: International Relations).

GVPT485 Government and Politics of the Middle East (3 Credits)
A comparative study of the governmental systems and political processes of Middle Eastern countries, with special emphasis on the problems of nation-building in emergent countries.
Prerequisite: GVPT200; and (GVPT282 or GVPT280).
Restriction: Must be in Government & Politics program.
Credit Only Granted for: GVPT485 or GVPT459E.
Formerly: GVPT459E.

GVPT487 Government and Politics of China (3 Credits)
Discussion of major issues in the study of the domestic politics of the People's Republic of China.
Restriction: Must be in one of the following programs (Government & Politics; Government & Politics: International Relations) ; and junior standing or higher.
Credit Only Granted for: GVPT359A or GVPT487.
Formerly: GVPT359A.

GVPT600 Professionalization Seminar in Political Science (1 Credit)
An introduction to the practices, norms, and expectations of professional political science.
Restriction: Must be in Government and Politics (Doctoral) program.

GVPT601 Research Design for Political Analytics (3 Credits)
A graduate-level introduction to empirical research techniques used in political science. The course covers different approaches to answering empirical research questions and addresses the strengths and limitations of different research decisions. Students who successfully complete the course will be able to conceptualize and design an empirical research project, as well as evaluate the research designs used in the research projects conducted by other social scientists.
Restriction: Must be in the Applied Political Analytics Master of Science program; or permission of department.

GVPT604 Introduction to War and Armed Conflict in World Politics (3 Credits)
Examines major theories of both international and civil wars and reviews major empirical studies that test theories of conflict. The topics include the onset of armed conflict, the duration and outcomes of wars, and the durability of peace in the aftermath of wars. The focus is on developing an understanding of central debates in the literature and primary empirical findings from quantitative and cross-national analyses that are of policy relevance.
Recommended: GVPT200.
Restriction: Must be in the MA in International Relations program; or permission of Government and Politics department.

GVPT605 Introduction to Conflict and Cooperation in the World Economy (3 Credits)
This seminar examines major theoretical approaches and empirical studies of international political economy, contemporary dynamics of globalization, the role of domestic politics in the formation of foreign economic policies of states, the dynamics of international trade and investment disputes, and role of international institutions in multi-lateral governance of the world economy. The focus is on developing an understanding of central debates in the literature and primary empirical findings from quantitative and cross-national analyses that are of policy relevance.
Prerequisite: GVPT604.
Restriction: Must be in the International Relations Master's program; or permission of Government and Politics department.

GVPT606 Introduction to International Institutions and International Law (3 Credits)
This seminar examines major theoretical approaches and empirical studies of international law and institutions relating to international political economy and international security. Topics to be covered include the sources of international law and the development of core legal principles in the post-WWII ear, the role of international economic institutions such as WTO, IMF, and World Bank in the global economy, and the influence of international institutions such as the UN Security Council, World Court, and International Criminal Court in addressing international security issues. Larger questions about the effectiveness of the WTO, Laws of War, and International Human Rights Law will be considered. The focus is on developing an understanding of central debates in the literature and primary empirical findings from quantitative and cross-national analyses that are of policy relevance.
Prerequisite: GVPT604.
Restriction: Must be in the International Relations Master's program; or permission of Government and Politics department.

GVPT621 Coding in Statistical Software (3 Credits)
Introduction to different statistical software packages used in empirical political research. Instruction to beginner and intermediate programming in STATA and R.
Restriction: Must be in the Applied Political Analytics Master of Science program; or permission of department.

GVPT622 Quantitative Methods For Political Science (3 Credits)
Introduction to quantitiative methods of data analysis, with emphasis on statistical methods and computer usage. Measures of association, probability, correlation, linear regression estimation techniques, introductory analysis of variance, and use of package computer programs.

GVPT624 National Security and International Relations (3 Credits)
Introduction to key areas of research in national security and international relations. Students will learn the major approaches to empirical research on national and international security and work with datasets focused on terrorist attacks and civil conflict.
Restriction: Must be in the Applied Political Analytics Master of Science program; or permission of department.

GVPT628 Advanced Topics in Coding for Political Analysis (3 Credits)
Students will explore advanced statistical software relevant to political data analysis. Specific topics may include Python, SQL, and GIS, among others. Provides students with advanced programming and coding skills valuable to employers, and expands abilities beyond R.
Restriction: Must be in Applied Political Analytics (APAN); or permission of department.
Repeatable to: 6 credits if content differs.

GVPT629 Seminar in Research Design (1 Credit)
This is designed to extend and deepen graduate students understanding of research design in empirical political science. Focus is placed on major issues in planning a research project: developing strong theories, formulating clear hypotheses, and crafting strategies to test theories and rule out rival, alternative explanations. Also, issues of effective communication of research will be considered. To get beyond abstractions, examples of research in American politics will be considered and evaluated. Technical issues of statistical analysis or broader epistemological questions in social science will not be covered.

GVPT635 Public Opinion (3 Credits)
Investigate how citizens in a democracy think about politics, form attitudes, and how public opinion shapes and is shaped by the political environment. While being exposed to core debates in public opinion and the study of public opinion, students will use a number of surveys that have been central to advancing our knowledge of public opinion.
Restriction: Must be in the Applied Political Analytics Master of Science program; or permission of department.

GVPT685 Voting, Campaigns, and Elections (3 Credits)
Introduction to the theoretical and empirical research on political participation, campaigns, and elections. By gaining an understanding of the literature and working with a variety of data sets, including surveys and voter history files, students will be equipped to carry out their own research on these topics.
Restriction: Must be in the Applied Political Analytics Master of Science program; or permission of department.

GVPT700 Scope and Method of Political Science (3 Credits)
Required of all Ph.D. candidates. A seminar in the methodologies of political science, and their respective applications to different research fields. Interdisciplinary approaches and bibliographical techniques are also reviewed.

GVPT701 International Relations Theory (3 Credits)
This seminar introduces students to key theoretical, methodological, and substantive concerns in international relations scholarship. It provides an overview of key areas of study including international conflict, international political economy, international organizations, and foreign policy. The course is designed as the core seminar for Ph.D. students enrolled in the Government and Politics graduate program who have chosen international relations as one of their areas of specialization. It will prepare students for more advanced, focused, courses. The course will be conducted in seminar format; students are expected to be prepared to discuss the readings in class each week.
Credit Only Granted for: GVPT708A or GVPT701.
Formerly: GVPT708A.

GVPT702 Geographic Information Systems for Social Science Research (3 Credits)
Introduction to the use of Geographic Information Systems for conducting research in the social sciences. Overview of spatially embedded nature of many social science phenomena and content of theories common to spatial thinking. Students will obtain hands-on experience with various GIS tools and methods most frequently employed by social scientists.
Credit Only Granted for: GVPT368I, GVPT702, or GVPT729D.
Formerly: GVPT729D.

GVPT708 Seminar in International Relations Theory (3 Credits)
An examination of the major approaches, concepts, and theories in the study of world politics with special emphasis on contemporary literature.
Repeatable to: 6 credits if content differs.

GVPT715 Applied Evaluation and Analysis of Government Policy (3 Credits)
The public policy approach at both state and federal levels; policy considerations and restrictions; methods of testing and evaluation; collecting and cleaning policy data.
Restriction: Must be in Applied Political Analytics (APAN); or permission of department.

GVPT718 Selected Topics in Political Science (3 Credits)
Selected topics in the field of political science.
Repeatable to: 9 credits if content differs.

GVPT722 Advanced Quantitative Methods For Political Science (3 Credits)
Introduction to multivariate analysis. Elementary matrix algebra, multiple linear and curvilinear correlation and regression, analysis of variance, canonical correlation and regression, discriminant analysis, and several types of factor analysis.
Prerequisite: GVPT622; or permission of instructor.

GVPT728 Advanced Topics in Modeling and Political Analysis (3 Credits)
Introduction to advanced modeling and data techniques that exist beyond linear and logistic regression. Topics may include Time Series modeling, Count modeling, Multinomial Logistic Modeling, and Natural Language Processing, among other methods.
Restriction: Must be in Applied Political Analytics (APAN); or permission of department.
Repeatable to: 6 credits if content differs.

GVPT729 Special Topics in Quantitative Political Analysis (3 Credits)
An intensive examination of special topics in quantitative methods of political analysis in such areas as survey research methods, exploratory data analysis, advanced data management techniques, or advanced methods of policy analysis.
Prerequisite: GVPT622; or permission of instructor.
Repeatable to: 6 credits if content differs.

GVPT743 Contemporary Political Theory (3 Credits)
Theorists from Nietzsche (1884-1900) to the present will be covered with a focus on the apparent failure of the Enlightenment to usher in an age of peace and reason.
Restriction: Must have graduate standing.

GVPT761 International Political Economy (3 Credits)
Major issues in international political economy including such matters as the monetary system, trade, debt, and development.
Recommended: GVPT708.

GVPT770 Seminar in American Political Institutions (3 Credits)
This is the core institutions seminar in American politics. The course surveys the primary literature in the field and addresses substantively significant topics related to the study of political institutions in the American context.

GVPT771 Seminar in American Political Behavior (3 Credits)
This is the core seminar in American political behavior. The course will deal with prominent theoretical and empirical issues in the areas of voting, public opinion, political participation and other aspects of political behavior in the American context.

GVPT780 Seminar in the Comparative Study of Politics (3 Credits)
An examination of the salient approaches to and conceptual frameworks for the comparative study of politics, followed by the construction of models and typologies of political systems.

GVPT799 Master's Thesis Research (1-6 Credits)

GVPT801 Conflict in World Politics (3 Credits)
Conflict in World Politics focuses on understanding conflict, both civil and international. We will examine theoretical arguments for and empirical analyses of the onset, duration, dynamics, and outcomes of conflicts. We will also examine alternatives for violent conflict, such as nonviolent resistance and rebel governance, that can exist alongside conflict as well. Finally, we will discuss international conflict management, with a particular focus on mediation and peacekeeping in response to civil war.
Additional Information: Students are expected to have a background in international relations theory.

GVPT803 Seminar in International Political Organization (3 Credits)
An overview and critical analysis of contemporary theory on international organizations and global governance.
Restriction: Must be in Government and Politics PhD program.

GVPT808 Selected Topics in Functional Problems in International Relations (3 Credits)
An examination of the major substantive issues in contemporary international relations.

GVPT828 Selected Problems in Political Behavior (3 Credits)
Individual reading and research reports on selected problems in the study of political behavior.

GVPT831 Formal Theories of Politics I (3 Credits)
Survey of major formal theories of politics, with emphasis on those theories based on the assumptions of rationality. The theory of public goods, game theory, coalition theory, and the theoretical properties of voting systems.

GVPT838 Topics in Formal Political Theory (3 Credits)
An examination of selected topics in formal theory.
Prerequisite: GVPT831; or permission of instructor.

GVPT848 Current Problems in Political Theory (3 Credits)
Intensive examination of the development of political theory since the Second World War.
Prerequisite: GVPT443.

GVPT849 Readings in Government and Politics (3 Credits)
Guided readings and discussions on selected topics in political science.

GVPT859 Selected Topics in Public Policy (3 Credits)
An examination of selected topics in public policy, such as judicial education, health, welfare, and resources policy.
Restriction: Permission of instructor.
Repeatable to: 6 credits if content differs.

GVPT868 Problems of State and Local Government (3 Credits)
Report of topics assigned for individual study in the field of state local government throughout the United States.

GVPT869 Seminar in Urban Administration (3 Credits)
Selected topics are examined by the team research method with students responsible for planning, field investigation, and report writing.

GVPT870 Interest Groups Politics in the United States (3 Credits)
The theory and practice of interest group politics in the United States.
Recommended: GVPT770.

GVPT873 Seminar in Legislatures and Legislation (3 Credits)
Reports on topics assigned for individual study and reading about the composition and organization of legislatures and about the legislative process.

GVPT874 Seminar in Political Parties and Politics (3 Credits)
Reports on topics assigned for individual study and reading in the fields of political organization and action.

GVPT877 The Politics of the Presidency (3 Credits)
The major research topics and issues pertaining to the United States presidency.
Recommended: GVPT770.

GVPT878 Problems in American Government and Politics (3 Credits)
An examination of contemporary problems in various fields of government and politics in the United States, with reports on topics assigned for individual study.

GVPT879 Topics on International Security (3 Credits)
A detailed and advanced analysis of particular regional problems on defense policy and arms control.
Recommended: GVPT876.
Repeatable to: 6 credits if content differs.

GVPT888 Selected Topics in Comparative Governmental Institutions (3 Credits)
An examination of special topics in comparative politics.

GVPT889 Selected Topics in Area Problems in International Relations (3 Credits)
Special topics concerning regional problems in the relations of states.

GVPT898 Pre-Candidacy Research (1-8 Credits)
Guided readings and discussions on selected topics in political science.

GVPT899 Doctoral Dissertation Research (1-8 Credits)

HACS - ACES-Cybersecurity

HACS402 Applied Security Analysis and Visualization (3 Credits)
Focuses on exploratory and statistical data analysis, data and information visualization, and the presentation and communication of analysis results. These topics will be presented and explored in the context of and with applications to cybersecurity related data.
Restriction: Must be a student in the ACES (Advanced Cybersecurity Experience for Students) Minor Program.

HACS408 Advanced Seminar in Cybersecurity (3 Credits)
Explores various lenses of cybersecurity in order to promote an interdisciplinary understanding of the field. Although each section may focus on a different topic, each integrates active student engagement, communication, critical communication, critical thinking, and teamwork.
Restriction: Must be a student in the ACES (Advanced Cybersecurity Experience for Students) Minor Program.
Repeatable to: 9 credits if content differs.

HACS408C Interpersonal Cyber Communications (3 Credits)
Designed to prepare students to participate in culturally responsible and environmentally appropriate communication in the workforce. Students will explore the industry standards for writing technical reports, as well as the variances between persuasive, team, written, and oral communication styles.
Restriction: Must be a student in the ACES (Advanced Cybersecurity Experience for Students) Minor Program.

HACS408L Analytical and Forensic Techniques for Cybersecurity (3 Credits)
Explores forensic artifacts contained in digital devices, security mechanisms available to protect digital devices and mechanisms available to cybersecurity professionals for analysis of digital devices. Topics include file structure and recovery of IoT and cell phone forensic data, network data capture and analysis, enterprise mobile device management analysis and forensic investigation of digital devices (IoT, telematics systems, etc.) that interact with cell phone and other devices. Incident response, timeline analysis, and detection and analysis of artifacts will be explored in a hands-on and lab-centric course using a variety of open-source tools and commercial cloud services.
Restriction: Must be a student in the ACES (Advanced Cybersecurity Experience for Students) Minor Program.

HACS408M Introduction to Cyber Threats and Risk Management (3 Credits)
Provides an exploration of cyber risk management and present-day cyber threats, their impacts, and their mitigations. Students will take a multi-disciplinary approach to understanding threats and risks including the technical, policy, and social aspects. This course is guided by real-world cyber threats and examples.
Restriction: Must be a student in the ACES (Advanced Cybersecurity Experience for Students) Minor Program.

HACS408O Internet of Things Security (3 Credits)
This increasingly interconnected world brings a need for understanding cybersecurity challenges associated with embedded devices and systems. This course will expose students to topics in Internet of Things (IoT) and Cyber Physical System (CPS) device types, IoT/CPS threat categories, security services, distributed networking, activity privacy, and intrusion detection for embedded environments. In addition to individual homework assignments, students will participate in a semester long group project involving research, design, and implementation.
Restriction: Must be a student in the ACES (Advanced Cybersecurity Experience for Students) Minor Program.

HACS408T Penetration Testing (3 Credits)
A hands-on, technically rigorous experience that prepares students for real-world work in penetration testing and offensive security. This course will allow students to gain proficiency and become comfortable using the tools, techniques, and methodologies that represent the state of the art in penetration testing today. Students should be comfortable on the command line, and a technical exposure to networking and basic proficiency in some scripting language (Bash, Ruby, or Python) is expected.
Restriction: Must be a student in the ACES (Advanced Cybersecurity Experience for Students) Minor Program.

HACS408V Data Analysis and Visualization for Cybersecurity (3 Credits)
Focuses on exploratory and statistical data analysis, data and information visualization, and the presentation and communication of analysis results. These topics will be presented and explored in the context of and with applications to cyber security related data. Examples and illustrations will often involve the R programming language, but prior experience with R is not required and submitted work may involve the use of other languages and tools at times.
Restriction: Must be a student in the ACES (Advanced Cybersecurity Experience for Students) Minor Program.

HACS479 Undergraduate Research in Cybersecurity (1-3 Credits)
The Advanced Cybersecurity Experience for Students (ACES) program encourages its students to engage in research in order to gain greater insight into a specific area within cybersecurity, obtain an appreciation for the subtleties and difficulties associated with the production of knowledge and fundamental new applications, and to prepare for graduate school and the workforce.
Restriction: Must be a student in the ACES (Advanced Cybersecurity Experience for Students) Minor Program; and permission of UGST-HCOL-ACES Cybersecurity Program.
Repeatable to: 6 credits if content differs.

HACS487 Undergraduate Research in Cybersecurity (3 Credits)
A semester-long, individualized academic research project. Students work with a faculty supervisor to design and research an original topic. Students engage in research to gain greater insight into a specific area within cybersecurity, obtain an appreciation for the subtleties and difficulties associated with the production of knowledge and fundamental new applications, and prepare for graduate school and/or the workforce.
Restriction: Must be a student in the ACES (Advanced Cybersecurity Experience for Students) Minor Program; and permission of UGST-HCOL-ACES Cybersecurity Program.

HACS497 Cybersecurity Experience Reflection (3 Credits)
Cybersecurity experience is defined as an experiential learning activity either with a University of Maryland entity or with an external organization that will provide valuable, hands-on experience to supplement the knowledge learned in other ACES coursework. This course is intended to help students reflect on their cybersecurity experience and to learn from others' cybersecurity experiences. It is also intended to help students gain professional skills that will aid in their future career.
Prerequisite: Students may enroll concurrently with or after completing a cybersecurity related internship experience of at least 135 hours.
Restriction: Must be a student in the ACES (Advanced Cybersecurity Experience for Students) Minor Program; and must not have taken HACS297.
Credit Only Granted for: HACS297 or HACS497.

HACS498 Cybersecurity Group Problem Solving (3 Credits)
The Advanced Cybersecurity Experience for Students (ACES) program encourages its students to engage in team problem solving activities in order to gain greater insight into a specific area within cybersecurity and to obtain an appreciation for the subtleties and difficulties associated with these activities in order to prepare students for graduate school and the workforce. Students engage in a semester long problem solving or development project under the mentorship of a industry specialist and with the guidance of university faculty. Through the exercise the students will develop teamwork experience and professional communication skills in addition to experience of the project itself. The project might be evaluation, creation, testing or analysis of some area of cybersecurity as needed by the mentor-sponsor. A contract of what will be accomplished is required must be agreed upon by the mentor, the student and the ACES leadership before the project can begin.
Restriction: Must be a student in the ACES (Advanced Cybersecurity Experience for Students) Minor Program; and permission of UGST-HCOL-ACES Cybersecurity Program.
Repeatable to: 6 credits.

HEBR - Hebrew

HEBR430 Critical Issues in Israeli Cinema (3 Credits)
Critical investigation of Zionist and Israeli culture and politics through film.
Cross-listed with: CINE430.
Credit Only Granted for: HEBR430, CINE430 or FILM430.
Formerly: FILM430.

HEBR498 Special Topics in Hebrew (3 Credits)
Repeatable to: 6 credits if content differs.

HEBR499 Independent Study in Hebrew (1-3 Credits)
Independent study under faculty supervision.
Prerequisite: Permission of instructor.
Repeatable to: 6 credits if content differs.

HESI - Higher Ed, Student Affairs, and International Ed Policy

HESI418 Special Topics in Leadership (3 Credits)
The special topics and leadership course will address a single topic related to leadership through the semester. In-depth study and analysis on the topic will be the basis for the course. Topics include gender and leadership, ethics and leadership, and culture and leadership. Leadership will serve as the foundation in the course.
Repeatable to: 6 credits if content differs.
Credit Only Granted for: HESI418 or EDCP418.
Formerly: EDCP418.

HESI421 Leadership and the Black Community (3 Credits)
Examines leadership from the perspective of the African American experience. Specifically, we will explore the concept and differing meanings of "leader and leadership" within the African-American community in the United States. Issues of leaders and leadership will be examined as influenced by political, cultural, and historic events. The course will place particular emphasis on colleges and universities as a microcosm of the larger society and as a cultural site for exploring and assessing issues of African American leadership.
Credit Only Granted for: HESI418B or HESI421.
Formerly: HESI 418B.

HESI422 Women and Leadership (3 Credits)
The primary goal of this course is for students to develop an understanding of women's leadership and women's ways of influencing organizations. The course will rely heavily on the idea that you must know yourself first before you explore how "you" fit into the organization and how that organization fits into a broader context such as nation, culture, or community. We will talk about the social constructs of leadership and gender, including systems and structures, and the role media, television, movies, and sports play in defining women and their leadership in a cultural context. The exploration of women leaders will be broad based including the role that gender identity and expression, race, sexual orientation, country of origin, and ethnicity/culture play in women's definition and the expression of their leadership.
Credit Only Granted for: HESI418G or HESI422.
Formerly: HESI418G.

HESI423 Leadership and Ethnicity (3 Credits)
Examines the concept of leadership from the standpoint of race, ethnicity, and culture. Specifically, we will explore the concept and differing meanings of leader and leadership within racial/ethnic communities in the United States. Issues of leaders and leadership will be examined as influenced by political, cultural, and historic events. The course will place particular emphasis on colleges and universities as a microcosm of the larger society and as a cultural site for exploring and assessing issues of race, ethnicity, diversity and leadership.
Credit Only Granted for: HESI418D or HESI423.
Formerly: HESI418D.

HESI424 Leadership and the Jewish Community (3 Credits)
Offers students the opportunity to critically examine leadership and leadership identity development in relation to Jewish culture and identity. Explores how Jewish culture and ethnicity influence leadership styles and the role that leadership has played within Jewish history. Students will explore general leadership theories as well as personal leadership identity development in both an overall sense and as a member of the Jewish community. Examines leaders within the Jewish movement and how their leadership has influenced Jewish communities and explores issues facing the Jewish community both on college campuses and in the world and prepare student leaders to act as advocates for the Jewish community.
Credit Only Granted for: HESI418F or HESI424.
Formerly: HESI418F.

HESI470 Introduction to Student Personnel (3 Credits)
A systematic analysis of research and theoretical literature on a variety of major problems in the organization and administration of student personnel services in higher education. Included will be discussion of such topics as the student personnel philosophy in education, counseling services, discipline, housing, student activities, financial aid, health, remedial services, etc.
Restriction: Permission of EDUC-Counseling, Higher Education and Special Education department.
Credit Only Granted for: EDCP470 or HESI470.
Formerly: EDCP470.

HESI489 Field Experiences in Higher Education, Student Affairs, and International Education Poli (1-4 Credits)
Planned field experience in education and community related activities. Credit not to be granted for experiences accrued prior to registration.
Restriction: Permission of EDUC-Counseling, Higher Education and Special Education department.

HESI498 Special Problems in Higher Education, Student Affairs, and International Education Policy (1-3 Credits)
Available only to HESI students who have formal plans for individual study of approved problems.
Prerequisite: Available only to HISA, HIED, and HIEP students who have formal plans for individual study of approved problems.
Restriction: Permission of EDUC-Counseling, Higher Education and Special Education department.

HESI499 Workshops, Clinics, Institutes (1-6 Credits)
The following type of educational enterprise may be scheduled under this course heading: workshops conducted by the Higher Education, Student Affairs, and International Education Policy program (or developed cooperatively with other departments, colleges and universities) and not otherwise covered in the present course listings.
Repeatable to: 6 credits.

HESI655 Organizational Dimensions of Student Affairs (3 Credits)
Exploration of leadership and organizational change of student affairs programs in post-secondary education.
Prerequisite: EDCP610; or permission of EDUC-Counseling, Higher Education and Special Education department.
Credit Only Granted for: EDCP655 or HESI655.
Formerly: EDCP655.

HESI671 Intergroup Dialogue Facilitation Practicum (3 Credits)
Developing knowledge and skills for facilitating intergroup dialogues. Using the principles and content of intergroup dialogues to create scenarios for the practice of listening, understanding, and taking action under theories of social justice.
Prerequisite: EDCP616 and HESI771; or permission of instructor.
Restriction: Limited to HESI Student Affairs Concentration students only.
Credit Only Granted for: EDCP671 or HESI671.
Formerly: EDCP671.

HESI672 Individual and Organizational Assessment in Student Affairs (3 Credits)
An examination of the scholarship and practice of assessment of college student learning and developmental outcomes as well as organizational practices that contribute to those outcomes.
Credit Only Granted for: EDCP672 or HESI672.
Formerly: EDCP672.

HESI739 Higher Education, Student Affairs, & International Education Policy Study Abroad (1-6 Credits)
An exploration of topics related to higher education, student affairs, & international education policy abroad. Participants engage in tenets associated with University of Maryland Education Abroad programs.
Repeatable to: 9 credits.

HESI771 The College Student (3 Credits)
A demographic study of the characteristics of college students as well as a study of their aspirations, values, and purposes.
Credit Only Granted for: EDCP771 or HESI771.
Formerly: EDCP771.

HESI773 Designing Qualitative Research in Counseling and Student Affairs Contexts (3 Credits)
Introduction to philosophical and epistemological foundations, methodologies and methods associated with qualitative research designs appropriate in student affairs and counseling contexts.
Credit Only Granted for: EDCP773 or HESI773.
Formerly: EDCP773.

HESP - Hearing and Speech Sciences

HESP400 Speech and Language Development in Children (3 Credits)
Analysis of the normal processes of speech and language development in children.
Prerequisite: Minimum grade of C- in HESP300; or permission of BSOS-Hearing & Speech Sciences department.
Recommended: LING200 or HESP120.
Restriction: Must be in Hearing and Speech Sciences program; or permission of BSOS-Hearing & Speech Sciences department.

HESP402 Language and Phonological Disorders in Children (3 Credits)
Etiology, assessment and treatment of language and phonological disorders in children.
Prerequisite: Minimum grade of C- in HESP400; or permission of BSOS-Hearing & Speech Sciences department.
Restriction: Must be in Hearing and Speech Sciences program.

HESP403 Introduction to Phonetic Science (3 Credits)
An introduction to physiological, acoustic and perceptual phonetics; broad and narrow phonetic transcription; current models of speech production and perception.
Prerequisite: Minimum grade of C- in HESP305; or permission of BSOS-Hearing & Speech Sciences department.
Restriction: Must be in Hearing and Speech Sciences program; or permission of BSOS-Hearing & Speech Sciences department.

HESP406 Acquired Neurogenic Communication Disorders in Adults (3 Credits)
Survey of the dysarthrias and aphasias in adults from an interdisciplinary point of view.
Prerequisite: Minimum grade of C- in HESP300 and HESP305; or permission of BSOS-Hearing & Speech Sciences department.
Restriction: Must be in Hearing and Speech Sciences program; or permission of BSOS-Hearing & Speech Sciences department.

HESP407 Bases of Hearing Science (3 Credits)
Fundamentals of hearing, including the physics of sound, anatomy and physiology of peripheral and central auditory nervous system, psychophysical procedures used in measurement of auditory sensation and perception, and topics in psychological acoustics.
Prerequisite: Minimum grade of C- in HESP311; or permission of BSOS-Hearing & Speech Sciences department.
Restriction: Must be in Hearing and Speech Sciences program; or permission of BSOS-Hearing & Speech Sciences department.
Credit Only Granted for: HESP307 or HESP407.

HESP411 Introduction to Audiology (3 Credits)
An introduction to the field of audiology. Evaluation and remediation of hearing handicaps.
Prerequisite: Minimum grade of C- in HESP311; or permission of BSOS-Hearing & Speech Sciences department.
Restriction: Must be in Hearing and Speech Sciences program; or permission of BSOS-Hearing & Speech Sciences department.

HESP413 Aural Rehabilitation/Habilitation (3 Credits)
The fundamental aspects of aural rehabilitation therapy for both adults and children are introduced to students. Class time will consist of lectures, discussions, and hands-on activities.
Prerequisite: HESP411.
Restriction: Sophomore standing or higher.

HESP415 Principles and Methods in Speech-Language Pathology (2 Credits)
The principles and methods required to provide treatment of speech and language disorders to children and adults. Topics include writing goals and objectives, programming,teaching strategies,session design, data collection, behavior modification and counseling.
Prerequisite: HESP400.
Restriction: Must be in Hearing and Speech Sciences program.

HESP416 Principles and Methods in Audiology (2 Credits)
Relate previous knowledge of anatomy/physiology and pathologies of the auditory system and integrate this information into clinical application.
Prerequisite: Minimum grade of C- in HESP411.
Restriction: Must be in Hearing and Speech Sciences program; and permission of BSOS-Hearing & Speech Sciences department.

HESP417 Principles and Methods in Speech-Language Pathology and Audiology (3 Credits)
The principles underlying the treatment of speech, language and hearing disorders in children and adults.
Prerequisite: HESP400 and HESP411; or permission of BSOS-Hearing & Speech Sciences department.
Restriction: Must be in Hearing and Speech Sciences program; or permission of BSOS-Hearing & Speech Sciences department.

HESP418 Clinical Practice in Speech-Language Pathology and Audiology (3 Credits)
Supervised observation with some direct participation in clinical methods for the treatment of disorders of articulation, fluency, child and adult language; evaluation and habilitation/rehabilitation of hearing impaired children and adults.
Prerequisite: Minimum grade of C- in HESP417.
Restriction: Permission of BSOS-Hearing & Speech Sciences department.
Repeatable to: 6 credits.

HESP420 Deaf Culture and ASL for the CSD Professional (3 Credits)
Studying Deaf Culture and American Sign Language (ASL) is crucial in enhancing the culturally competent practice of allied health/ Communication Sciences and Disorders (CSD) professionals. This course explores the politics of (dis)ability through the lens of the experience of d/Deafness and the emergence of the Deaf community as a linguistic and cultural group in the United States, as well as issues that impact the provision of services to this population.
Prerequisite: HESP202 and EDSP220.
Credit Only Granted for: HESP498A or HESP420.
Formerly: HESP498A.

HESP422 Neurological Bases of Human Communication (3 Credits)
Basic neurology as it pertains to anatomy and physiology substrates of speech and language.
Prerequisite: HESP305; or permission of instructor.
Credit Only Granted for: HESP498 or HESP422.

HESP458 Global Perspectives in Communication Sciences and Disorders (3 Credits)
Provides students with a supervised and multidisciplinary international service learning (ISL) opportunity for the reciprocal exchange of cultural perspectives, knowledge, and skills. Through interactions with Ghana health and educational professionals as well as patients/clients and their families, students will gain perspective on broader health issues such as determinants of health, health disparities, and the global burden of disease. Students will have learning opportunities in governmental and non-governmental organizations (NGOs) to gain knowledge of and experience with varied healthcare and educational systems in under-resourced communities. In addition to observing and working with Ghana Speech-Language Therapists (SLT) and other rehabilitative professionals, students will assist faculty in the provision of educational workshops for professionals and/or outreach activities for the community.
Prerequisite: HESP202, HESP300, HESP311, and HESP400; and one course from (HESP406, HESP411, or HESP402).
Jointly offered with: HESP659.
Restriction: Must be a major in Hearing and Speech Sciences .
Repeatable to: 6 credits.
Credit Only Granted for: HESP659 or HESP458.
Additional Information: This course will require students to travel out of the country.

HESP468 Professional Development in Research and Academia (1 Credit)
The purpose of this seminar is to complement your honors project with practical advice on how to navigate successful careers in research and academia. As you progress through your undergraduate years (especially if you work in a lab), you will likely make several unofficial observations about life as a graduate student, postdoc, or professor, and overhear conversations that include new terminology that may be confusing (e.g., research mentorship, grants, conference abstract, tenure). This can create a mysterious aura around what it is like to obtain your PhD and work in academia generally. In this class, we will cover tips and skills that are often passed along informally in the lab; but here, we will discuss these issues overtly from a range of perspectives, experiences, and best practices.
Restriction: Must be in the Hearing and Speech Sciences Honors program; or permission of Hearing and Speech Sciences department.
Repeatable to: 3 credits if content differs.
Additional Information: This course would be taken for three semesters.

HESP469 Honor Thesis Research (1-3 Credits)
Student will develop thesis proposal, conduct research, analyze results, develop and defend final written document.
Prerequisite: Permission of honors thesis advisor required.
Repeatable to: 6 credits if content differs.

HESP489 Undergraduate Research Experience (1-3 Credits)
Undergraduate research experience working under HESP faculty or outside affiliates.
Prerequisite: HESP202.
Restriction: Permission of BSOS-Hearing & Speech Sciences department; and sophomore standing or higher.
Repeatable to: 6 credits.
Formerly: HESP388.

HESP498 Seminar (3 Credits)
Selected topics in human communication and its disorders.
Restriction: Permission of BSOS-Hearing & Speech Sciences department.
Repeatable to: 6 credits if content differs.

HESP499 Independent Study (1-3 Credits)
A directed study of selected topics pertaining to human communication and its disorders.
Restriction: Permission of BSOS-Hearing & Speech Sciences department.
Repeatable to: 6 credits if content differs.

HESP600 Instrumentation in Hearing and Speech Sciences (3 Credits)
Types and principles of operation of electronic equipment used in the hearing and speech sciences.
Restriction: Must be in Clinical Audiology: Au.D. or Ph.D. (Doctoral) program; and permission of BSOS-Hearing & Speech Sciences department. Or permission of instructor.

HESP601 Foundations of Scientific Inquiry (1 Credit)
Overview of methods of empirical research used in Communication Sciences and Disorders. The course will focus on identifying, critically analyzing, and writing about empirical research.
Restriction: Must be in Hearing and Speech Sciences: M.A. (Master's) program; or permission of Instructor.
Additional Information: Course meets over three semesters for the duration of the Masters of Speech-Language Pathology program.

HESP602 Advanced Seminar in Neurological Bases of Communication (2 Credits)
An advanced discussion of the neural bases of human communication and its disorders, neuroimaging, neural plasticity and neurological evaluations, with emphasis on current developments and critical analysis.
Prerequisite: An undergraduate course in human neuroanatomy.
Restriction: Permission of BSOS-Hearing & Speech Sciences department.

HESP603 Seminar in Cultural and Linguistic Diversity in Communication Disorders (1 Credit)
Overview of cultural and linguistic diversity (CLD) in general, and the impact of CLD on communication, communication disorders, and the professional practice of Speech-Language Pathology
Restriction: Must be in Hearing and Speech Sciences: M.A. (Master's) program; or permission of Instructor.
Additional Information: Course meets over four semesters for the duration of the Masters of Speech-Language Pathology program.

HESP605 Assessment & Intervention in Bilingual Populations (3 Credits)
Integrates foundational knowledge pertaining to bilingualism in speech-language pathology. This course provides students with a framework for working with individuals from culturally and linguistically diverse backgrounds. This course is designed to educate and train student clinicians to serve as bilingual speech-language pathologists.
Restriction: Must be in Hearing and Speech Sciences: M.A. (Master's) program.

HESP606 Basic Hearing Measurements (3 Credits)
Theoretical principles, methodology, and interpretation of routine audiometric tests, including pure tone, speech, and acoustic immittance measures. Modification of procedures for special populations. Equipment calibration and mass hearing screening programs.
Prerequisite: HESP411; or students who have taken courses with comparable content may contact the department.
Restriction: Must be in Clinical Audiology: Au.D. or Ph.D. (Doctoral) program; and permission of BSOS-Hearing & Speech Sciences department. Or permission of instructor.

HESP610 Language Disorders in Adults (2 Credits)
Etiology, diagnosis and management of language problems of adults associated with aging, brain injury and degenerative conditions.
Restriction: Must be in Hearing and Speech Sciences: M.A. (Master's) program; or permission of instructor.

HESP611 Cognitive Disorders in Adults (2 Credits)
Etiology, diagnosis and management of cognitive problems of adults associated with aging, brain injury and degenerative conditions.
Prerequisite: Must have completed or be concurrently enrolled in HESP610; and must have knowledge of basic human neuroanatomy.
Restriction: Must be in Hearing and Speech Sciences: M.A. (Master's) program; or permission of instructor.

HESP612 Fluency Disorders (2 Credits)
The nature of fluency disorders. Principles, methods and procedures for the clinical management of fluency disorders in children and adults.
Restriction: Must be in Hearing and Speech Sciences: M.A. (Master's) program; and permission of BSOS-Hearing & Speech Sciences department. Or permission of instructor.

HESP613 Autism Spectrum Disorders (2 Credits)
Etiology, diagnosis and management of autism spectrum disorders.
Restriction: Must be in Hearing and Speech Sciences: M.A. (Master's) program; or permission of instructor.
Credit Only Granted for: HESP639A or HESP613.
Formerly: HESP639A.

HESP615 Counseling in Communicative Disorders (3 Credits)
Introduction to the application of counseling principles and methodologies for working with individuals with communication disorders and their families. The role of the audiologist and speech language pathologist as counselors will be explored. Class content will focus on theoretical approaches and techniques to counseling from the fields of psychology, social work, and family the family therapy. The application of counseling in the diagnostic process as well as treatment of a wide variety of communication disorders will be highlighted throughout the course.
Recommended: HESP400 and HESP411.

HESP616 Language Disorders in the Pre-school Age (2 Credits)
Theoretical, empirical and clinical perspectives on language disorders in children from infancy through pre-school age.
Prerequisite: HESP400; or students who have taken courses with comparable content may contact the department.
Restriction: Must be in Hearing and Speech Sciences: M.A. (Master's) program; and permission of BSOS-Hearing & Speech Sciences department. Or permission of instructor.

HESP617 Cultural and Linguistic Diversity in Communication and its Disorders (2 Credits)
An exploration and discussion of cultural and linguistic diversity, its impact on communication and communication disorders, and strategies for assessment and intervention of culturally and linguistically diverse clients
Recommended: HESP417 or equivalent.
Restriction: Must be in one of the following programs (Hearing and Speech Sciences: Ph.D. (Doctoral); Clinical Audiology: Au.D. or Ph.D. (Doctoral); Hearing and Speech Sciences: M.A. (Master's)).

HESP620 Speech Production Disorders Across the Lifespan (3 Credits)
Assessment and treatment of phonological, articulatory and resonance disorders arising from various etiologies including developmental conditions, structural abnormalities, and nervous system damage.
Restriction: Must be in Hearing and Speech Sciences: M.A. (Master's) program; or permission of instructor.

HESP621 Bilingualism in Children and Adults (3 Credits)
Provides an overview of topics related to bilingualism in both pediatric and adult populations, with an emphasis on application in the field of communication disorders. This course explores theories of bilingual language acquisition, typical and atypical bilingual development, cognition in bilinguals, and the neurological underpinnings of bilingualism. This course will provide practicing clinicians with foundational knowledge related to bilingualism in both pediatric and adult populations. Currently there are no existing courses that provide this content with a focus on communication disorders.

HESP623 Education, Policy & Advocacy in Bilingual Service Delivery (3 Credits)
Bilingual education and associated policy issues in the US as they relate to the field of speech-language pathology. Topics include bilingual education models, disproportionality, and the legal framework related to bilingual service delivery in education settings.

HESP624 Voice Disorders (2 Credits)
Etiological characteristics, assessment and treatment of phonatory disorders in children and adults.
Restriction: Permission of BSOS-Hearing & Speech Sciences department; or must be in Hearing and Speech Sciences: M.A. (Master's) program.

HESP625 Dysphagia (3 Credits)
Nature and clinical management of dysphagia as it pertains to different clinical settings for adult and pediatric populations.
Restriction: Permission of BSOS-Hearing & Speech Sciences department; or must be in Hearing and Speech Sciences: M.A. (Master's) program.

HESP626 Language disorders in school-aged children and adolescents (2 Credits)
Etiology, assessment and treatment of communication and learning problems in school age children and adolescents

HESP627 Augmentative and Alternative Communication (2 Credits)
Principles, methods, and procedures for categorizing, understanding, and developing augmentative and alternative communication.
Recommended: Prior knowledge of Communication and its Disorders is required.
Restriction: Permission of BSOS-Hearing & Speech Sciences department.
Credit Only Granted for: HESP639R or HESP627.

HESP630 Electrophysiological Measurements (3 Credits)
Principles and techniques of physiological and electrophysiological measures of the audio-vestibular mechanisms.
Prerequisite: HESP606.
Restriction: Must be in Clinical Audiology: Au.D. or Ph.D. (Doctoral) program; and permission of BSOS-Hearing & Speech Sciences department. Or permission of instructor.

HESP632 Medical Audiology (3 Credits)
Overview of auditory pathologies, and their assessment and management in the medical setting.
Prerequisite: HESP311.
Corequisite: HESP606.

HESP634 Anatomy and Physiology of the Auditory and Vestibular Systems (3 Credits)
Comprehensive examination of the anatomy and physiology of the peripheral as well as the central auditory and vestibular systems. Both afferent and efferent pathways will be considered. Applications of basic auditory neuroscience to contemporary clinical audiology practice will be highlighted.
Prerequisite: Must have completed or be concurrently enrolled in HESP311, HESP407, and HESP411; or permission of instructor.
Additional Information: Fills a requirement for the Doctoral Program in Clinical Audiology (CAUD). Open to students in other graduate programs, especially NACS.

HESP635 Aural Rehabilitation/Habilitation (3 Credits)
Principles, methods and procedures for aural rehabilitation/habilitation in children and adults.

HESP636 Geriatric Audiology (3 Credits)
Research findings are presented on the physical effects of aging on the auditory periphery and central nervous system, as well as the consequences of aging on behavioral and electrophysiologic measures of auditory function. Clinical implications in the effects of physiologic and cognitive aging on auditory performance will be discussed.
Prerequisite: HESP606 and HESP700.
Restriction: Must be in one of the following programs (Hearing and Speech Sciences: Ph.D. (Doctoral); Clinical Audiology: Au.D. or Ph.D. (Doctoral); Hearing and Speech Sciences: M.A. (Master's)).

HESP638 Research Practicum (1-3 Credits)
Analysis, synthesis and integration of knowledge related to current research or clinical issues in human communication and its related disorders.
Restriction: Permission of BSOS-Hearing & Speech Sciences department.
Repeatable to: 6 credits if content differs.

HESP639 Special Topics in Hearing and Speech Sciences (1-3 Credits)
Intensive coverage of selected topics of current interest.
Restriction: Permission of BSOS-Hearing & Speech Sciences department.
Repeatable to: 6 credits if content differs.

HESP645 Pediatric Audiology (3 Credits)
Evaluation and treatement of hearing-impaired children.
Prerequisite: HESP606.
Restriction: Must be in Clinical Audiology: Au.D. or Ph.D. (Doctoral) program; and permission of BSOS-Hearing & Speech Sciences department. Or permission of instructor.

HESP648 Clinical Practice in Speech (1-3 Credits)
Supervised training in the application of clinical methods in the diagnosis and treatment of speech disorders.
Restriction: Permission of instructor.
Repeatable to: 6 credits.

HESP648A Clinical Practice in Speech: Diagnostic Procedures (1-3 Credits)
Supervised training in the application of clinical methods in the diagnosis of speech disorders.
Restriction: Permission of instructor.

HESP648B Clinical Practice in Speech: Therapeutic Procedures (1-3 Credits)
Supervised training in the application of clinical methods in the treatment of speech disorders.
Prerequisite: HESP648A.
Restriction: Permission of instructor.
Repeatable to: 6 credits.

HESP649 Clinical Practice in Audiology (1-3 Credits)
Supervised training in the application of clinical methods in the diagnosis and treatment of hearing disorders.
Restriction: Permission of instructor.
Repeatable to: 6 credits.

HESP649A Clinical Practice in Audiology: Diagnostic Procedures (1-3 Credits)
Supervised training in the application of clinical methods in the diagnosis of hearing disorders.
Restriction: Permission of instructor.
Repeatable to: 6 credits.

HESP649B Clinical Practice in Audiology - Aural Rehabilitation (1 Credit)
A clinical practicum course with individualized instruction, which focuses on the skills necessary to provide intervention and counseling for a wide range of disorders of the auditory system in patients of varying ages and cultural backgrounds. Each student will be various activities across three semesters (Spring YR2, Summer YR2, and Fall YR3). Students may work individually or in pairs to provide hearing loss intervention, auditory training, hearing loss prevention education, and communication strategy training. The student is expected to prepare for each session with a complete clinical plan, educational materials, and counseling strategies. Students must meet with the Audiologist prior to the aural rehabilitation (AR) session to discuss the plan of care. During the visit, the student will perform hearing loss handicap assessments, lead counseling sessions regarding rehabilitative options, make modifications to existing treatment plans/hearing aids, and educate the patient about their hearing. Following the visit, the student will document the encounter according to clinical protocol and ethical standards using the electronic medical records system. All patient-related information will be handled within a secure computer environment which meets HIPAA regulations for protected health information.
Prerequisite: HESP649A.

HESP658 Special Clinical Topics in Hearing and Speech (1-3 Credits)
Comprehensive coverage of selected topics pertinent to clinical issues. Specific content varies each semester, and may include supervision, clinical ethics, etc.
Restriction: Permission of BSOS-Hearing & Speech Sciences department.
Repeatable to: 6 credits if content differs.

HESP659 Global Perspectives in Communication Sciences and Disorders (3 Credits)
Provides students with a supervised and multidisciplinary international service learning (ISL) opportunity for the reciprocal exchange of cultural perspectives, knowledge, and skills. Through interactions with Ghana health and educational professionals as well as patients/clients and their families, students will gain perspective on broader health issues such as determinants of health, health disparities, and the global burden of disease. Students will have learning opportunities in governmental and non-governmental organizations (NGOs) to gain knowledge of and experience with varied healthcare and educational systems in under-resourced communities. In addition to observing and working with Ghana Speech-Language Therapists (SLT) and other rehabilitative professionals, students will assist faculty in the provision of educational workshops for professionals and/or outreach activities for the community.
Recommended: HESP702, three semesters of HESP648B, one semester HESP648A.
Jointly offered with: HESP458.
Restriction: Must be in the M.A. program in Speech Language Pathology or Au.D. program in Audiology.
Repeatable to: 6 credits.
Credit Only Granted for: HESP659 or HESP458.
Additional Information: This course will require students to travel out of the country.

HESP700 Hearing Aids (3 Credits)
Principles, methods and procedures for selection, fitting, calibration and management of amplification systems for hearing-impaired children and adults.

HESP701 Hearing Aids II (3 Credits)
Advanced issues in amplification technology, prescriptive hearing aid selection, and management of amplification systems for special populations.
Prerequisite: HESP700.
Restriction: Must be in one of the following programs (Hearing and Speech Sciences: Ph.D. (Doctoral); Clinical Audiology: Au.D. or Ph.D. (Doctoral); Hearing and Speech Sciences: M.A. (Master's)) ; and permission of BSOS-Hearing & Speech Sciences department. Or permission of instructor.

HESP702 Diagnostic Procedures in Speech-Language Pathology (2 Credits)
Diagnostic tools and methods in the analysis of speech-language disorders in children and adults.
Restriction: Must be in Hearing and Speech Sciences: M.A. (Master's) program; and permission of BSOS-Hearing & Speech Sciences department. Or permission of instructor.

HESP704 Audiology Practice Management (3 Credits)
Basics of clinical business management both in the context of private practice in Audiology and as a department in a healthcare corporation.
Prerequisite: HESP606, HESP706, HESP700, and HESP701; or permission of instructor.

HESP706 Advanced Clinical Audiology (3 Credits)
Advanced clinical and experimental methods of evaluating the peripheral and central auditory system using acoustic stimuli. Procedural considerations and interpretation of test results.
Prerequisite: HESP606; or students who have taken courses with comparable content may contact the department.

HESP708 Independent Study (1-6 Credits)
Individual research projects under guidance of a faculty member.
Restriction: Permission of instructor.
Repeatable to: 6 credits.

HESP710 Industrial and Environmental Noise Problems (3 Credits)
Evaluation and control of noise hazards. Effects of noise on man. Medico-legal aspects of noise-induced hearing impairment.
Restriction: Permission of instructor.

HESP712 Cochlear Implants and Other Implantable Technologies (3 Credits)
Comprehensive presentation of cochlear implant design and processing, medical/surgical aspects, evaluation, programming, outcomes in children and adults, and post stimulation care. The role of the audiologist as a member of the cochlear implant team will be emphasized. Current and emerging trends in other implantable technologies also will be covered.
Prerequisite: Must have completed or be concurrently enrolled in HESP700, HESP701, and HESP722; or permission of instructor.

HESP722 Psychoacoustics (3 Credits)
Auditory perception and auditory processing in normal and impaired hearing.

HESP724 Research Design (3 Credits)
Evaluations of research designs, critique of published articles and student involvement in designing experiments on assigned topics.
Prerequisite: Must have completed a course in basic statistics.

HESP728 Advanced Clinical Practice in Speech (1-8 Credits)
Clinical internship in selected off-campus facilities.
Prerequisite: HESP648.
Restriction: Permission of instructor.
Repeatable to: 8 credits.

HESP729 Advanced Clinical Practice in Audiology (1-8 Credits)
Clinical internship in selected off-campus facilities.
Prerequisite: HESP649.
Restriction: Permission of instructor.
Repeatable to: 8 credits.

HESP730 Vestibular-ocular Assessment and Management (Electrophysiologic Measures II) (3 Credits)
Advanced principles and methods of evaluating vestibular-ocular function using electrophysiologic measures. Includes rehabilitative issues pertaining to balance disorders and advanced electrophysiologic measures of auditory system function.
Prerequisite: HESP630.

HESP731 Seminar in Clinical Supervision (1 Credit)
Supervising students and employees can be a daunting task. Fostering the next generation of doctors of audiology and support staff requires a unique set of knowledge and skills. This course is designed to explore the theoretical concepts in the supervisory paradigm as well as real-world scenarios. Supervision is not a "one-size fits-all" process, therefore the intricacies and strategies of the supervisor-supervisee relationship must be carefully considered.
Prerequisite: In at least the third year in AuD program.

HESP732 Hearing Aids Lab (1 Credit)
Laboratory experience covering clinical procedures of concepts addressed in concurrent academic course, Hearing Aids 1 (HESP700). This laboratory is 1-credit and graded separately from HESP700. Students will be given the opportunity for hands-on practice in the use of amplification devices for the treatment of hearing impairment. As the first lab in the course series, students will be able to describe and apply current best practices required for amplification-based aural (re)habilitation for patients across the lifespan including those that may differ from them in race, ethnicity, gender identity, sexual orientation, and socioeconomic background.
Corequisite: HESP700.

HESP733 Hearing Aids II Lab (1 Credit)
Laboratory experience covering clinical procedures addressed in concurrent academic course, Hearing Aids 2 (HESP701). This laboratory is 1-credit and graded separately from HESP701. Students will be given the opportunity for hands-on practice in the use of amplification devices for the treatment of hearing impairment. As the second lab in the course series, students will be able to perform the assessment, selection, fitting, verification, validation, adjustment, modification, counselling, and troubleshooting activities required for amplification-based aural (re)habilitation independently.
Prerequisite: HESP700 and HESP732.
Corequisite: HESP701.

HESP734 Basic Hearing Measurement Laboratory (1 Credit)
Supplemental lab experience that coincides with HESP606: Basic Hearing Measurement. Students will complete hands-on learning activities to reinforce theoretical concepts from the didactic learning in HESP606. The goal of this lab is to facilitate the transfer of learning from the classroom to clinical practicum.
Prerequisite: HESP416.
Corequisite: HESP606.

HESP735 Hearing, Aging, and Public Health (3 Credits)
Public health promotes and protects the health of all people and their communities. This course introduces public health concepts and demonstrates how they might be applied or are integral to the practice of Audiology when interacting with older adults. Topics discussed include foundational aspects of epidemiology, aging, chronic conditions common with age and association with hearing, social determinants and accessibility, and health care utilization and policy. Students will be challenged to consider a focus on hearing as it relates to broader and interdisciplinary health services and how this consideration may be incorporated into their clinical practice and experiences. This course is designed for CAUD students who have at least some clinical experience to provide perspective to the topics discussed.
Prerequisite: HESP606.
Credit Only Granted for: HESP735 or HESP636.

HESP737 Quantitative Methods for Hearing, Speech, and Language Sciences (3 Credits)
Quantitative methods related to Hearing, Speech, and Language Science research. This includes data representation and visualization, calculation of descriptive statistics, estimation and hypothesis testing. Learning to use data analysis in Excel and statistical computer packages like SPSS is emphasized as a core competency of the course.
Credit Only Granted for: HESP639E or HESP737.
Formerly: HESP639E.

HESP788 Graduate Research Externship (1-3 Credits)
Off-campus research internship with departmental affiliates at National Institutes of Health and other regional universities. Contact department chairman for available placements, requirements and openings.
Recommended: HESP724.

HESP799 Master's Thesis Research (1-6 Credits)

HESP808 Current Research in Hearing, Speech and Language Services (1-3 Credits)
Current research in speech, language and hearing sciences and disorders.
Restriction: Must be in one of the following programs (Hearing and Speech Sciences: Ph.D. (Doctoral); Clinical Audiology: Au.D. or Ph.D. (Doctoral); Hearing and Speech Sciences: M.A. (Master's)) ; and permission of BSOS-Hearing & Speech Sciences department.
Repeatable to: 6 credits if content differs.

HESP818 Seminar in Language Processing (3 Credits)
Information processing models of language, relationships among language, memory and cognition.
Restriction: Must be in one of the following programs (Hearing and Speech Sciences: Ph.D. (Doctoral); Clinical Audiology: Au.D. or Ph.D. (Doctoral); Hearing and Speech Sciences: M.A. (Master's)) ; and permission of instructor.
Repeatable to: 6 credits if content differs.

HESP828 Seminar in Hearing Science (3 Credits)
Recent developments in auditory psychophysics, and/or anatomy and physiology of the periperal and central auditory mechanisms.
Restriction: Must be in one of the following programs (Hearing and Speech Sciences: Ph.D. (Doctoral); Clinical Audiology: Au.D. or Ph.D. (Doctoral); Hearing and Speech Sciences: M.A. (Master's)) ; and permission of BSOS-Hearing & Speech Sciences department.
Repeatable to: 6 credits if content differs.

HESP829 Clinical Internship Residency (1-9 Credits)
Off-Campus, full-time (30-40 hours/week) clinical externship in Audiology at regional and national institutions.
Prerequisite: Must have completed HESP729 for two semesters; and must have completed the comprehensive exams successfully.
Restriction: Permission of BSOS-Hearing & Speech Sciences department.
Repeatable to: 18 credits if content differs.

HESP838 Seminar in Language Acquisition (3 Credits)
Models of normal and disordered first language acquisition, second language acquisition and bilingualism.
Restriction: Must be in one of the following programs (Hearing and Speech Sciences: Ph.D. (Doctoral); Clinical Audiology: Au.D. or Ph.D. (Doctoral); Hearing and Speech Sciences: M.A. (Master's)) ; and permission of instructor.
Repeatable to: 6 credits if content differs.

HESP848 Seminar in Audiology (3 Credits)
Research tipics realted to hearing assissment, amplification, and audiologic rehabilitation.
Restriction: Must be in one of the following programs (Hearing and Speech Sciences: Ph.D. (Doctoral); Clinical Audiology: Au.D. or Ph.D. (Doctoral); Hearing and Speech Sciences: M.A. (Master's)) ; and permission of instructor.
Repeatable to: 6 credits if content differs.

HESP849 Capstone Research Project I (2 Credits)
First of two-course sequence leading to the final research requirement for the Doctor of Audiology (Au.D.) degree; involves individual study and/or supervised lab work with mentor, preparation of research proposal (including IRB protocol if required), and attendance at Capstone Research Project Workshop.
Prerequisite: HESP724.
Restriction: Must not be in Clinical Audiology: Au.D. or Ph.D. (Doctoral) program.

HESP858 Seminar in Speech Pathology (3 Credits)
Problems in disordered articulation, voice, fluency and dysphagia.
Restriction: Must be in one of the following programs (Hearing and Speech Sciences: Ph.D. (Doctoral); Clinical Audiology: Au.D. or Ph.D. (Doctoral); Hearing and Speech Sciences: M.A. (Master's)) ; and permission of instructor.
Repeatable to: 6 credits if content differs.

HESP859 Capstone Research Project II (1-4 Credits)
Second of two-course sequence leading to the final research requirement for the Doctor of Audiology (Au.D.) degree; involves final data collection, analysis and presentation of results or completion of scholarly paper under the direction of the faculty mentor.
Prerequisite: Must have completed or be concurrently enrolled in HESP849.
Restriction: Must be in Clinical Audiology: Au.D. or Ph.D. (Doctoral) program.
Repeatable to: 6 credits if content differs.

HESP868 Seminar in Speech Science (3 Credits)
Problems in speech acoustics and physiology.
Restriction: Permission of instructor.
Repeatable to: 6 credits.

HESP878 Seminar in Language Disorders (3 Credits)
Congenital and acquired language disorders of children and adults.
Restriction: Permission of instructor.
Repeatable to: 6 credits.

HESP879 Academic Research Seminar (1 Credit)
An overview of issues relevent to the research process will be provided.Topics rotate on a semester basis and include ethics, grantsmanship, professional presentations, research publications, and peer review of journal articles. A formal product (e.g., poster presentation, platform presentation, peer review, IRB application) will be required each semester.
Restriction: Must be in Hearing and Speech Sciences: Ph.D. (Doctoral) program.
Repeatable to: 3 credits if content differs.

HESP887 Academic Research Seminar (2 Credits)
This course has a focused, rotating set of topics each semester to cover professional and academic issues, including ethics, grantsmanship, professional presentations, professional publications, and peer review of journal articles.
Prerequisite: HESP724.
Restriction: Must be in one of the following programs (Hearing and Speech Sciences: Ph.D. (Doctoral); Clinical Audiology: Au.D. or Ph.D. (Doctoral)).

HESP888 Seminar in Neurological Bases of Language (3 Credits)
Neural ststrates of language function, brain image of normal and disordered language function, and neural plasticity for language.
Restriction: Must be in one of the following programs (Hearing and Speech Sciences: Ph.D. (Doctoral); Clinical Audiology: Au.D. or Ph.D. (Doctoral); Hearing and Speech Sciences: M.A. (Master's)) ; and permission of instructor.
Repeatable to: 6 credits if content differs.

HESP889 Doctoral Candidacy Research (1-3 Credits)
Doctoral candidacy paper research
Restriction: Must be in one of the following programs (Hearing and Speech Sciences: Ph.D. (Doctoral); Clinical Audiology: Au.D. or Ph.D. (Doctoral)) ; and permission of instructor.
Repeatable to: 6 credits if content differs.

HESP898 Pre-Candidacy Research (1-8 Credits)

HESP899 Doctoral Dissertation Research (1-8 Credits)

HISP - Historic Preservation

HISP600 History, Theory, and Practice of Historic Preservation (3 Credits)
An introduction to history, theory and practice of historic preservation covered through readings, discussions, presentations, class projects, and field trips.
Prerequisite: Permission of ARCH-Historic Preservation Program.

HISP611 Historical Research Methods (3 Credits)
Research methods used by professional historic preservationists to identify and record historic structures and sites. Emphasizes inter/multidisciplinary nature of contemporary preservation practice using archival and ethnographic evidence as a basis for establishing significance.
Prerequisite: Permission of ARCH-Historic Preservation Program.
Credit Only Granted for: HISP610 or HISP611.

HISP615 The Everyday and the "American" Environment (3 Credits)
An introduction into the theories of the everyday with the context of the American built environment. The course focuses primarily on the American experience of underrepresented, minority, and immigrant communities; both historical and contemporary. The course attempts to challenge what is meant by American in describing the American every day built environment.
Prerequisite: Permission of ARCH-Historic Preservation Program. Also offered as: HISP200.
Credit Only Granted for: HISP615, HISP619E, or HISP200.
Formerly: HISP619E.

HISP619 Special Topics in Historic Preservation (1-6 Credits)
Technical aspects of preservation taught by practitioners whose expertise are of special benefit to certificate students.
Repeatable to: 12 credits if content differs.

HISP628 Selected Topics in Historic Preservation (3 Credits)
Critical issues in contemporary preservation practice will be examined. Topics will change each year, according to the professor's interests and the relevance of the course topic, and will include such themes as: preservation of the everyday built environment, social and ethnic dimensions of historic preservation practice, and preservation of Modern architecture and landscapes. The course will consist of readings, class, discussions, and a substantial individual research project.
Restriction: Permission of instructor.
Repeatable to: 6 credits if content differs.

HISP629 Independent Studies in Historic Preservation (1-3 Credits)
Individual Instruction course.
Restriction: Permission of ARCH-Historic Preservation Program.

HISP630 Preservation Policy and Planning (3 Credits)
An opportunity is provided to look in depth at the national historic preservation program that is the federal, tribal, state, and local (city and county) public sector preservation activities being undertaken in accordance with public policy set by laws, regulations, standards, and guidelines.
Prerequisite: Permission of ARCH-Historic Preservation Program.
Credit Only Granted for: HISP619M or HISP630.
Formerly: HISP619M.

HISP635 Social and Ethnic Issues in Historic Preservation Practice (3 Credits)
This seminar course examines the broader social and ethnic dimensions of historic preservation practice that have impacted the field since the "culture wars" of the 1990's. Through weekly case studies of local, international sites, students will explore these issues and apply newly emerging methodologies to their final case study project.
Prerequisite: Permission of ARCH-Historic Preservation Program.
Credit Only Granted for: HISP628E or HISP635.
Formerly: HISP628E.

HISP640 Historic Preservation Law, Advocacy and Public Policy (3 Credits)
Introduce students to legal, advocacy, and public policy issues in the field of historic preservation. Student activities will be designed to teach basic working knowledge of relevant legal subjects, including historic preservation ordinances, state and federal preservation statutes, and important constitutional issues.
Prerequisite: Permission of ARCH-Historic Preservation Program.
Credit Only Granted for: HISP619C or HISP640.
Formerly: HISP619C.

HISP645 Archaeology and Preservation (3 Credits)
An introduction to issues related to archaeological resources and preservation. Topics will include method and theory in American archaeology, archaeology in support of architectural history, archaeology and the NHPA, archaeological site preservation and conservation, and curation and collections management. Students will have a chance to work at an archaeological site to experience field excavation techniques and challenges, and will visit other archaeological sites and curation facilities in the area.
Prerequisite: Permission of ARCH-Historic Preservation Program.
Credit Only Granted for: HISP619A or HISP645.
Formerly: HISP619A.

HISP650 Historic Preservation Studio Workshop (6 Credits)
Students carry out a group preservation project in a local community, from inception and problem formulation through completion. Guided carefully by a faculty team, students will conduct research, interact with communities, perform analyses, and propose solutions for an issue or problem of direct relevance to a local community and client group.
Prerequisite: HISP600; and permission of ARCH-Historic Preservation Program.
Restriction: Must be in a major in ARCH-Historic Preservation Program.

HISP655 American Vernacular Architecture (4 Credits)
History, theory, and practice of American vernacular architecture including a review of common building technologies, structure, and style, and focusing on methods and approaches for recording, documenting and analyzing these historic resources.
Prerequisite: Permission of ARCH-Historic Preservation Program.
Credit Only Granted for: HISP655 or HISP619V.
Formerly: HISP619V.

HISP660 Internship in Historic Preservation (3 Credits)
Students will secure a summer internship with an organization engaged in historic preservation work (this can be a public agency, nonprofit, or private firm). The students will formulate a plan of work and a series of pedagogical goals to satisfy both the practical needs of the project and the academic requirements for the course.
Prerequisite: Permission of ARCH-Historic Preservation Program.
Formerly: HISP619.

HISP670 Conservation of Historic Places: Historic Materials, Building Systems, and Conservation (3 Credits)
Introduces students to the analysis of historic buildings, building systems and materials. The overall emphasis is on assessing the condition of a building and its parts, and formulating a preservation strategy based on it. Conservation methods will be discussed through the introduction of philosophies and specific techniques.
Prerequisite: Permission of ARCH-Historic Preservation Program.
Credit Only Granted for: HISP619T or HISP670.
Formerly: HISP619T.

HISP678 Fieldwork in Historic Preservation (3 Credits)
Advanced fieldwork in research and documentation of historic sites and structures including primary local history research, building analysis, survey techniques, field photography, and graphic documentation techniques.
Repeatable to: 6 credits if content differs.

HISP679 Introduction to Measured Drawings for Historic Preservation (3 Credits)
Teaches graphic documentation methodologies for historic buildings, including hand measuring, drafting, preparing a sketch plan, analyzing buildings, and producing finished drawings in ink. Students will analyze building in situ.
Repeatable to: 6 credits if content differs.

HISP680 Preservation Economics (3 Credits)
Students are introduced to a range of economic theories, methods, and issues that must be considered in the practice of historic preservation. Case studies related to community economic development, adaptive reuse, tax credit programs, project finance, and land use will be presented.
Prerequisite: Permission of ARCH-Historic Preservation Program.
Credit Only Granted for: HISP619N or HISP680.
Formerly: HISP619N.

HISP690 Historic Preservation Professional Practice (2 Credits)
Students explore management and practice issues in the historic preservation field. Topics include: project management, budgeting, personnel, and grantsmanship. Each topic will be considered in the three main areas of practice - government agencies, non-profits, and for profit companies. Outside speakers from these various practice environments will present on their area of specialization.
Restriction: Permission of instructor.

HISP701 Certificate Portfolio Project (1 Credit)
Students will gather samples of their work and craft a synthetic statement on their experiences in their HISP certificate courses (for example, picking up on themes such as community involvement, diversity of practice, affordable housing, or sustainability), and the ways in which they have integrated historic preservation into their thinking and practice in their home discipline.
Prerequisite: Permission of ARCH-Historic Preservation Program.

HISP710 Final Project in Historic Preservation I (1 Credit)
An independent, applied research project investigating the preservation of a particular site or a specialized issue in historic preservation. This is part one of a two-semester sequence and involves developing the project proposal and bibliography.
Credit Only Granted for: HISP700 or HISP710.
Formerly: HISP700.

HISP711 Final Project in Historic Preservation II (2 Credits)
An independent, applied research project invesitgating the preservation of a particular site or a specialized issue in historic preservation. This is part two of a two semester sequence and involves project research and writing.
Credit Only Granted for: HISP700 or HISP711.
Formerly: HISP700.

HIST - History

HIST401 Science and Gender (3 Credits)
Examines the role of women and gender in the history of science. Includes consideration of barriers to women's participation in science; women's role as scientific subjects and researchers; and questions about the scientific construction of gender and the gendered construction of science.
Credit Only Granted for: HIST401 or HIST429R.
Formerly: HIST429R.

HIST403 Trashed! Garbage and Recycling in History (3 Credits)
What counts as valuable and what counts as trash? Who gets to decide? Who produces trash and who picks it up? By answering these questions, students will explore how humans have produced, dealt with, and ignored trash and recycling in the 19th and 20th century in both urban and rural settings.
Credit Only Granted for: HIST403 or HIST428P.
Formerly: HIST428P.

HIST405 Environmental History (3 Credits)
An introduction to the key issues and methods of environmental history. The scope of the subject is discussed, as well as its relationship with other disciplines, such as ecology, anthropology, and geography. A primary focus is environmental change in history with emphasis on the American experience.

HIST406 History of Technology (3 Credits)
The changing character of technology in modern history, beginning with the Middle Ages. Concentrates on the Industrial Revolution and its aftermath, the nature of technological knowledge and the sources of technological change.

HIST407 Technology and Inequality (3 Credits)
How are social inequality and technology related? Have technologies exacerbated social tensions or have they ameliorated them? In the age of climate change, pandemics, and economic transformations, this class looks at technology in history to examine previous transitions in production, infrastructures, computing, and pollution. The emphasis is on the interplay between society and technology in the 19th and 20th centuries.

HIST408 Senior Seminar (3 Credits)
A capstone course for history majors, designed to increase historical knowledge and the ability to analyze texts and arguments. Topics will focus on the literature of a particular field and primary-source research.
Restriction: Must be in History program.
Repeatable to: 6 credits if content differs.

HIST412 History of Women and Gender in Africa (3 Credits)
An examination of socio-economic and cultural change in Africa from the dawn of the colonial era in the 19th century to independence in the mid-twentieth century. Major focus on how African women understood and responded to the expansion of European empires, changes in the colonial economy, and impact of westernization and urbanization.
Credit Only Granted for: HIST412 or HIST428L.
Formerly: HIST428L.

HIST415 Ideas and Politics in Europe Since 1900 (3 Credits)
Examination of intersection of ideas and politics in Europe since 1900. Focus will be on advocates of liberalism, social democracy, fascism, Nazism, communism, and conservatism and their impact on politics and policy since 1900.

HIST416 History of Slavery and the Slave Trade in Africa (3 Credits)
Examines the history and impact of the slave trade on African states, societies, and economies. Investigates the meaning of slavery in Africa, the local uses of slavery there and Africa's connections to the Trans-Saharan, Red Sea, and Trans-Atlantic slave trades.
Credit Only Granted for: HIST416 or HIST419Y.
Formerly: HIST419Y.

HIST417 Colonial Encounters: Natives, Spaniards, and Africans in the New World (3 Credits)
An exploration of the discourses and practices of the Spanish colonial project in the New World and the ways in which Indians and Blacks were incorporated into or excluded from that project. Also examines native and African resistance and adaptation to Spanish rule, and the process of transformation and hybridization of Spanish, native and African cultures in Spanish America. An analysis of recent historiographical developments that have profoundly changed the understanding of the Spanish conquest and colonization of the New World.
Recommended: HIST220 and HIST250.
Credit Only Granted for: HIST417 or HIST428Y.
Formerly: HIST428Y.

HIST418 Jews and Judaism: Selected Historical Topics (3 Credits)
Prerequisite: HIST281, HIST283, HIST106, HIST286, or HIST282; or permission of instructor.
Repeatable to: 6 credits if content differs.

HIST419 Special Topics in History (3 Credits)
Repeatable to: 9 credits if content differs.

HIST419Q Before the Holocaust: The Golden Age of Eastern European Jewry (3 Credits)
An exploration of the history of the Jews of Eastern Europe from the period of the Polish Lithuanian Commonwealth until the Holocaust. Topics to be covered include religious, political, social, and cultural transformation of Jewish life in Eastern Europe in the context of the general political changes in the area.
Cross-listed with: JWST370.
Credit Only Granted for: JWST419E, JWST370, or HIST419Q.
Formerly: JWST419E.

HIST421 Medieval Heresies (3 Credits)
An examination of twelfth- and thirteenth-century heresies in the medieval West. Consideration of why so many heretics emerged, and how the church attempted to deal with them, and what effect their persecution had on Europe both then and later. Special attention given to groups that stood on the fine line between heresy and orthodox religion.
Credit Only Granted for: HIST408L or HIST421.
Formerly: HIST408L.

HIST425 Imperial Russia (3 Credits)
The rise and fall of the Russian Empire, Peter the Great to the collapse of tsarism in revolution. Emphasis on the evolution of autocracy, social groups, national identities, and cultural change.

HIST428 Selected Topics in History (3 Credits)
Repeatable to: 9 credits.

HIST429 Special Topics in History (3 Credits)
Repeatable to: 9 credits.

HIST429X Tradition and Change: Jewish Religion in the Modern World (3 Credits)
An exploration of the history of the different modern Jewish religious movements that developed in Europe, starting with messianic movements and ending with Reform and Orthodoxy. Emphasis will be placed on the influence of the academic study of Judaism on the development of modern Jewish religious ideologies and practices.
Cross-listed with: JWST347, RELS347.
Credit Only Granted for: RELS347, JWST347, HIST429X, or RELS419R.
Formerly: RELS419R.

HIST430 Reformations in Politics, Religion, and Gender: England 1485-1603 (3 Credits)
An examination of the political, religious, and social forces in English life, 1485-1603, with special emphasis on Tudor government, the English reformation, and the Elizabethan era.

HIST431 Becoming Great Britain, 1603-1704 (3 Credits)
An examination of the political, religious, and social forces in English life, 1603-1714, with special emphasis on Puritanism and the English revolutions.

HIST434 Victoria's Secrets: Sex and Class in Nineteenth Century Britain (3 Credits)
Queen Victoria, Jack the Ripper, Sherlock Holmes, Oscar Wilde, and Charles Darwin--all of them were "Victorians" yet just what did that word mean and what values did it encompass? This course will examine the social and cultural life of Great Britain from 1830 to 1900, and encompass the worlds of the elite upper classes to the slums of London's East End. We will pay particular attention to the various meanings of Victorianism and the myths and practices of progress, morality, reform, and imperial conquest that defined the era. We will focus on the "Two Nations" residing within Britain and how government and moral reformers addressed conditions of social inequality, poverty, and crime. Victorian medicine and science and their intersection with empire will be covered. We will also address Victorian notions of class, race, gender, and sexuality and how they were shaped by and influenced the politics and culture of everyday life.
Credit Only Granted for: HIST419A or HIST434.
Formerly: HIST419A.

HIST436 Napoleon, the French Revolution and the World (3 Credits)
An argument for the broad continuity between the revolutionary and Napoleonic wars.

HIST437 Modern France from Napoleon to DeGaulle (3 Credits)
The changing political and cultural values of French society in response to recurrent crises throughout the 19th and 20th centuries. Students should have had some previous survey of either Western civilization or European history.

HIST441 Germany Since 1900 (3 Credits)
Course places Nazism in context of German and European history. Topics include collapse of German democracy and the establishment of the Nazi dictatorship; the role of Hitler; the response of political, military, economic, diplomatic, legal, media, theological elites and the broader population; the mix of terror, consent and coercion; propaganda and Nazi culture; contours of Nazi racial ideology and anti-Semitism and their impact on domestic and foreign racial policy; the economic history of the Nazi regime; foreign policy from rearmament to launching World War II to expansion and defeat; Jewish policy from the years of persecution to those of extermination; Nazi policy in Eastern and Western Europe, towards the United States, and towards North Africa and the Middle East; why the Allies won World War II and why and how Nazi Germany was defeated; the nature of the Allied occupation after 1945; the Nuremberg war crime trials; aftermath of facing and avoiding the crimes of the Nazi regime in West and East Germany.

HIST442 Twentieth-Century Russia (3 Credits)
Russia and the Soviet Union from the fall of the tsars to the post-communist present. Impact of Leninism, Stalinism, and Soviet Communism on state, society, culture, and nationality.

HIST444 America in the 1960s (3 Credits)
Celebrated and vilified, the years between 1960 and 1970 represented a watershed in twentieth-century American history. Although history rarely falls neatly within 10-year divisions, the 1960s - as both historical era and historical idea - witnessed enormous political, social, and cultural changes. This course will examine the seminal events, actors, and movements that continue to shape our nation.
Credit Only Granted for: HIST319V or HIST444.
Formerly: HIST319V.

HIST450 American Capitalism: 1600-1900 (3 Credits)
This course explores the transformation of economic life in what became the United States from pre-colonial times to 1900, with special emphasis on economic interactions among Native American, Mexican, and European societies; how and why capitalism took root and became dominant; economic dimensions of the Revolutionary and Civil Wars; why the North, South, and West followed distinct economic paths; the revolutions in transportation and communications; slavery as a business system; causes and consequences of industrialization; and trends in the distribution of wealth and income.

HIST451 American Capitalism: 1900 to Present (3 Credits)
An examination of the evolution of American capitalism from 1900 to the present, with special attention on the emergence of the United States as the world's leading economic power; the impact of big business on work and government regulation; causes and consequences of the Great Depression; the role of business in the two world wars; postwar growth followed by the decline of U.S. global competitiveness; why consumerism occupied a central role in U.S. history; the influence of economic theory on policymaking; realities and mythologies of Reaganomics and Clintonomics; and the economic impact of the digital revolution.

HIST452 Diplomatic History of the United States to 1914 (3 Credits)
American foreign relations from the American Revolution to the beginning of World War I. International developments and domestic influences that contributed to American expansion in world affairs. Analyses of significant individuals active in American diplomacy and foreign policy.

HIST453 Diplomatic History of the United States from 1914 (3 Credits)
American foreign relations in the 20th century. World War I, the Great Depression, World War II, the Cold War, the Korean War, and Vietnam. A continuation of HIST452.

HIST454 Constitutional History of the United States: From Colonial Origins to 1865 (3 Credits)
The interaction of government, law, and politics in the constitutional system. The nature and purpose of constitutions and constitutionalism; the relationship between the constitution and social forces and influences, the way in which constitutional principles, rules, ideas, and institutions affect events and are in turn affected by events. The origins of American politics and constitutionalism through the Constitutional Convention of 1787. Major constitutional problems such as the origins of judicial review, democratization of government, slavery in the territories, secession, and civil war.

HIST455 Constitutional History of the United States: Since 1865 (3 Credits)
American public law and government, with emphasis on the interaction of government, law, and politics, and the relationship between the constitution and social forces and influences, the way in which constitutional principles, rules, ideas, and institutions affect events and are in turn affected by events. Major crises in American government and politics such as Reconstruction,the rise of corporate power, civil liberties during wartime, the New Deal era, the civil disorders of the 1960s.

HIST459 Society in America: Historical Topics (3 Credits)
A consideration of selected aspects of American society from colonial times to the present. Special emphasis on regionalism, immigration, nativism, minorities, urbanization, and social responses to technological changes.
Repeatable to: 6 credits if content differs.

HIST460 History of Labor in the United States (3 Credits)
The American working class in terms of its composition; its myths and utopias; its social conditions; and its impact on American institutions.

HIST462 Slavery, Sectionalism, and the U.S. Civil War (3 Credits)
Slavery, sectionalism, and the coming of the Civil War. Resources and strategy of the Confederacy and the Union, the war's changing character, emancipation and its consequences, conditions on the home front, and the wartime origins of Reconstruction.

HIST465 Oral History of Immigration (3 Credits)
Uses oral history to explore experiences of migrants to the Washington, D.C. area since the mid-twentieth century in projects based on engagement with local immigrants.
Credit Only Granted for: HIST428M or HIST465.
Formerly: HIST428M.

HIST466 Immigration and Ethnicity in the U.S. (3 Credits)
Seminar exploring historical problems relating to US immigration, race, and ethnicity since 1848, with emphasis on cultural impacts of migration on immigrants, their children, and U.S. society.
Credit Only Granted for: AAST498L or HIST466.

HIST467 Women and Reform Movements in the Twentieth-Century United States (3 Credits)
Investigation of women's participation in such twentieth-century reform movements as the labor movement, the struggle for racial justice, social welfare reform, and women's movements. Will ask how race, class, and gender were implicated in the ways that women agitated for social political change.
Recommended: HIST201, HIST211, or HIST255.
Credit Only Granted for: HIST467 or HIST429E.
Formerly: HIST429E.

HIST469 Study Abroad Special Topics IV (1-6 Credits)
Special topics course taken as part of an approved study abroad program.
Repeatable to: 15 credits if content differs.

HIST470 Corporations on Trial (3 Credits)
Examines legal challenges to corporations around the world over the past 200 years through selected case studies. Topics include globalization, empires, the world wars, and the emergence of human rights, corporate social responsibility, and environmental justice.
Credit Only Granted for: HIST419X or HIST470.
Formerly: HIST419X.

HIST473 History of the Caribbean (3 Credits)
Offers a concise introduction to the history of the Caribbean regions from the Columbian voyages to the 20th century. Special emphasis is given to the dynamics of local social and cultural formations within the framework of the political and economic history of the Atlantic world.

HIST476 Jews in Medieval Times 1000-1450 (3 Credits)
Social and cultural life of Jewish communities spread throughout Islam and Christendom. Major topics include the Gaonate, kehila organizations, legal, rationalist, and mystical thought, and the context of rising animosity against Jews linked to the Crusades and changing Church doctrines.
Recommended: HIST282, HIST330, HIST331, or JWST234.
Cross-listed with: JWST432.
Credit Only Granted for: HIST476 or JWST432.

HIST481 A History of Modern China (3 Credits)
Modern China from 1644 to the People's Republic of China. Emphasis on the coming of the West to China and the various stages of the Chinese reaction.

HIST482 History of Japan to 1800 (3 Credits)
Traditional Japanese civilization from the age of Shinto mythology and introduction of continental learning down to the rule of military families, the transition to a money economy, and the creation of a townsmen's culture. A survey of political, economic, religious, and cultural history.

HIST483 History of Japan Since 1800 (3 Credits)
Japan's renewed contact with the Western world and emergence as a modern state, industrial society, and world power, 1800-1931; and Japan's road to war, occupation, and recovery, 1931 to the present.

HIST490 Seven Revolutions in Modern Africa (1945-) (3 Credits)
Seven Revolutions samples theoretical, contemporaneously produced, and leading scholarly (secondary) texts about seven revolutionary situations faced by Africans from ca. 1952 through to the 21st century. In past years we have devoted weeks or double weeks to the Mau Mau (Kenya), Ethiopian derg, Zimbabwe's factions and structural racism, Guinea and women's subalternity, Patrice Lumumba's assassination, race vs. settler as a framework, Liberia's intersection with continental history in the 1980s, among other focuses.
Credit Only Granted for: HIST428B or HIST490.
Formerly: HIST428B.

HIST491 History of the Ottoman Empire (3 Credits)
Survey of the Ottoman Turkish Empire from 1300 A.D. to its collapse during World War I. Emphasis on the empire's social and political institutions and its expansion into Europe, the Arab East and North Africa.

HIST492 Women and Society in the Middle East (3 Credits)
Examines the customs, values and institutions that have shaped women's experience in the Middle East in the past and in the contemporary Middle East.
Recommended: Prior coursework in Middle East studies or gender studies.
Cross-listed with: WGSS456.
Credit Only Granted for: HIST492, WMST456 or WGSS456.
Formerly: WMST456.

HIST495 Women in Medieval Culture and Society (3 Credits)
Medieval women's identity and cultural roles: the condition, rank and rights of medieval women; their access to power; a study of women's writings and the constraints of social constructs upon the female authorial voice; and contemporary assumptions about women.
Cross-listed with: WGSS455.
Credit Only Granted for: HIST495, WMST455 or WGSS455.
Formerly: WMST455.

HIST499 Independent Study (1-3 Credits)
Restriction: Permission of ARHU-History department.
Repeatable to: 6 credits.

HIST601 History and Contemporary Theory (3 Credits)
An introduction to contemporary theories in philosophy, literary criticism, cultural studies, anthropology, and other fields; and analysis of their usefulness to historians.

HIST607 The Teaching of History in Institutions of Higher Learning (1 Credit)

HIST608 General Seminar (3 Credits)
General seminar in student's major field of study (e.g., U.S.; Women and Gender; International, World, and Comparative; Science and Technology; Latin America) exploring the concentration's major issues, topics, and literature.
Restriction: Permission of ARHU-History department.
Repeatable to: 9 credits if content differs.

HIST609 Readings in the History of Science and Technology (3 Credits)

HIST610 Introduction to Museum Scholarship (3 Credits)
Provides students a basic understanding of museums as cultural and intellectual institutions. Topics include the historical development of museums, museums as resources for scholarly study, and the museum exhibition as medium for presentation of scholarship.
Cross-listed with: AMST655, ANTH655, INST653.
Credit Only Granted for: AMST655, ANTH655, HIST610, INST728T or INST653.

HIST618 Readings in Women's and Gender History (3 Credits)

HIST619 Special Topics in History (1-3 Credits)

HIST628 Readings in Colonial American History to 1763 (3 Credits)
Major historical literature on various groups and developments in the European colonies that later became the United States through the period ending with the British-French "Great War for Empire."

HIST629 Readings in the American Revolution and New Nation, 1763 to 1812 (3 Credits)

HIST638 Special Topics in History (3 Credits)
Special Topics in History.
Repeatable to: 9 credits if content differs.

HIST639 Special Topics in History (3 Credits)
Special Topics in History.
Repeatable to: 9 credits if content differs.

HIST648 Readings in Early 20th-Century America, 1900-1941 (3 Credits)
Major historical literature on various groups and developments in the United States between the Progressive Era and the beginning of World War II.

HIST649 Readings in Recent American History, 1941-Present (3 Credits)
Key subjects, themes, and historiographic debates in the history of the United States from 1941 to the present.

HIST658 Readings in American Constitutional and Legal History (3 Credits)
Historical literature on the American constitutional order from the colonial foundations to the present. The founding and development of political and constitutional institutions examined from the perspectives of law, politics, government and political philosophy.

HIST659 Readings in American Cultural and Intellectual History (3 Credits)
Major historical literature pertinent to the cultural/intellectual development of the varied peoples of the United States.

HIST668 Readings in American Social History (3 Credits)
Major historical literature related to specific issues in the social history of the United States.

HIST669 Readings in U.S. Economic and Business History (3 Credits)
An overview of U.S. economic and business history and historiography from colonial times to the present. Emphasizes the methodologies of "new" economic historians and institutional business historians, the evolving role of the state in the American economy, and cultural dimensions of economic change.
Repeatable to: 6 credits.

HIST678 Readings in American Labor History (3 Credits)
Major historical literature related to the development of the American working class, the labor movement, and gender/racial/ethnic issue within them.

HIST679 Readings in the History of American Foreign Policy (3 Credits)
Major historical literature related to the diplomacy and international relations of the United States.

HIST688 Special Topics: Collaborative Curation (3 Credits)
This seminar considers the history of curation and curators within the institutional setting of museums and offers participants the opportunity, and challenge, to engage in curatorial practice by planning an exhibition that focuses on a critical aspect of life at and around the University of Maryland over the years.
Prerequisite: AMST655, ANTH655 or HIST610.
Recommended: AMST856, ANTH856, or HIST810; and AMST857, ANTH857 or HIST811.
Cross-listed with: AMST659, ANTH659, INST788.
Restriction: Must have permission of the Museum Studies and Material Culture program.
Repeatable to: 6 credits if content differs.
Additional Information: Students enrolled in the MSMC (Museum Studies and Material Culture) certificate program will be given priority for enrollment.

HIST689 Readings in Southern History (3 Credits)
Major historical literature centered on the development and peoples of the southern United States.

HIST698 Professional Internship (3 Credits)
Internship with a professional organization in the historical disciplines or related fields.
Restriction: Must be in one of the following programs (History (Master's); History (Doctoral)).
Repeatable to: 6 credits if content differs.

HIST708 Directed Independent Reading for Comprehensive Examinations I (1-4 Credits)
Directed reading in preparation for Doctoral Comprehensive Examinations. In consultation with their advisors, students will select a number of books and articles from an approved list. Grading for the course will reflect performance on the written and oral sections of the Comprehensive Examinations.
Restriction: Permission of ARHU-History department.
Repeatable to: 12 credits if content differs.

HIST709 Directed Independent Reading for Comprehensive Examinations II (1-4 Credits)
Directed reading in preparation for Doctoral Comprehensive Examinations. In consultation with their advisors, students will select a number of books and articles from an approved list. Grading for the course will reflect performance on the written and oral sections of the Comprehensive Examinations.
Repeatable to: 12 credits if content differs.

HIST711 Final Project in Historic Preservation II (2 Credits)
An independent, applied research project investigating the preservation of a particular site or a specialized issue in historic preservation. This is part two of a two-semester sequence and involves project research and writing.
Credit Only Granted for: HISP700 or HISP711.
Formerly: HISP700.

HIST718 Readings in Medieval History (3 Credits)

HIST719 Readings in the History of the Renaissance and Reformation (3 Credits)

HIST720 Readings in the History of the Catholic Church (3 Credits)
This is graduate-level readings seminar in the modern history of the Catholic Church. We will begin with the Reformation and proceed through the present day. This course will combine European history with global history, looking both at how the Church changed in the face of major turning points in modern European history (the Scientific, French, and Russian Revolutions; the two world wars; and the Cold War) and at its missionary encounters and long-term presence across the world (in Latin America, India, China, Africa, and North America).

HIST729 Readings in Modern European History (3 Credits)
Reading knowledge of some European language recommended but not required.

HIST739 Readings in the History of Great Britain (3 Credits)

HIST748 Readings in Modern French History (3 Credits)

HIST749 Readings in German History, 1815 to the Present (3 Credits)
Reading knowledge of German is encouraged, but not required.
Repeatable to: 9 credits if content differs.

HIST758 Readings in Eastern European History (3 Credits)
Selected topics in the history of the Hapsburg monarchy and the successor states, Poland and the Balkans. Emphasis on the rise of nationalism during the 19th century and the experience with fascism and communism in the 20th century.
Repeatable to: 6 credits if content differs.

HIST759 Readings in Russian and Soviet History (3 Credits)

HIST768 Readings in Chinese History (3 Credits)

HIST778 Readings in Latin American History (3 Credits)

HIST779 Readings in Middle Eastern History (3 Credits)

HIST789 Readings in Modern European Intellectual History (3 Credits)

HIST798 Readings in Jewish History (3 Credits)
Readings on selected topics in Jewish history. Emphasis on analysis of primary sources. Reading knowledge of Hebrew recommended.
Repeatable to: 6 credits.

HIST799 Master's Thesis Research (1-6 Credits)

HIST808 Seminar in the History of Science and Technology (3 Credits)

HIST809 Seminar in the History of Women and Gender (3 Credits)
Repeatable to: 9 credits if content differs.

HIST810 Museum Research Seminar (3 Credits)
A research seminar focusing on the practice and presentation of cultural and historical scholarship in museums and historical sites. Students will complete an original research project on the challenges and opportunities of public exhibition and interpretation of cultural and historical research.
Prerequisite: AMST655, ANTH655, or HIST610.
Cross-listed with: AMST856, ANTH856, INST786.
Credit Only Granted for: AMST856, ANTH856, HIST810, INST728U or INST786.

HIST811 Museum Scholarship Practicum (3-6 Credits)
Students devise and carry out a research program using the collections at the Smithsonian Institution or some other cooperating museum, working under joint supervision of a museum professional and a university faculty member.
Prerequisite: AMST856, ANTH856, or HIST810.
Cross-listed with: AMST857, ANTH857, INST787.
Restriction: Permission of Museum Scholarship Program required.
Credit Only Granted for: AMST857, ANTH857, HIST811, INST728I or INST787.

HIST819 Special Topics in History: Independent Research (1-3 Credits)
Individual graduate research in an area not covered by current seminar offerings. The product will be a finished research paper normally based on original materials.
Restriction: Must be in History program; and permission of ARHU-History department.
Repeatable to: 6 credits if content differs.

HIST829 Seminar in Latin American History (3 Credits)

HIST838 Seminar in Ancient History (3 Credits)
Restriction: Permission of instructor.
Repeatable to: 6 credits.

HIST839 Seminar in Medieval and Early Modern European History (3 Credits)

HIST848 Seminar in Modern European History (3 Credits)

HIST849 Seminar in Russian and Soviet History (3 Credits)

HIST869 Seminar in Recent American History (3 Credits)

HIST878 Seminar in Colonial American History (3 Credits)

HIST879 Seminar in the American Revolution and Formative Period (3 Credits)

HIST888 Seminar in the Middle Period and Civil War (3 Credits)

HIST898 Pre-Candidacy Research (1-8 Credits)

HIST899 Doctoral Dissertation Research (1-8 Credits)

HLHP - Health and Human Performance

HLHP615 Crises of Aging: Time, Retirement and Widowhood (3 Credits)
A cross-disciplinary and multidisciplinary investigation of phenomena which comprise a significant portion of the issues confronting an older adult's life: (1) introduction to multiple processes of adulthood and aging; (2) the concepts and meaning of time; (3) pre-retirement and retirement adjustments; and (4) loss and widowhood.
Formerly: PERH615.

HLHP625 Issues in Retirement: Theory and Practice (3 Credits)
Multidisciplinary examination of retirement phenomena, including theories of transition, government and private sector policies, social expectations, physical correlates, personal adjustments, and economic consequences. Emphasis upon research utilization.
Formerly: PERH625.

HLHP688 Field Work in Aging (1-6 Credits)
Sequences of supervised field experience in the field of aging, including direct service, administration, research, or training. Emphasis on career exploration and assessment in relation to the field of aging.
Prerequisite: Permission of SPHL-School of Public Health.
Formerly: PERH688.

HLHP689 Selected Problems in Health, Physical Education and Recreation (1-6 Credits)
Research projects in special areas in health, physical education and/or recreation which have interdisciplinary implications not covered in structured courses.
Formerly: PERH689.

HLHP780 Interdisciplinary Issues in Aging (3 Credits)
Multidisciplinary approaches to the processes of aging to achieve a more holistic understanding. Pedagogical research dissemination, peer instruction, guest lecturing, and informal discussion. The demonstration of the multilateral nature of growing older. Discussion of cross-disciplinary and interdisciplinary research proposals.
Formerly: PERH780.

HLSA - Health Services Administration

HLSA465 Redesigning Mental Health Services (3 Credits)
Students will use Design Thinking to create, reshape, redesign and transform the ways in which mental health and wellness is perceived and addressed on the campus. This course will incorporate students and the UMD community as stakeholders in designing, planning and contributing to developing solutions that leverage existing mental health resources or create new pathways to improve mental health and wellness at UMD. Students will learn and use design thinking skills to enhance public health practice skills in project proposals and grant writing.
Prerequisite: HLTH366.
Recommended: EPIB301.

HLSA484 Redesigning Health Care: Developing a Clinic to Meet Community Needs (3 Credits)
Provides an opportunity for students to learn a key entrepreneurial skill, Human Centered Design Thinking, while helping to build, reshape, redesign and transform delivery of health care in the Mona Center, a new community center and clinic in Prince George's County. This new, modern vision for a health and wellness clinic embraces student involvement in designing, planning and contributing to innovative programs, solutions, and processes to improve the clinic's ability to meet community and patient needs by addressing the social determinants of health as well as traditional clinical health status. Students in the class will develop empathy for patients, providers and other stakeholders, define problems, select a specific problem for intervention, understand problems based on stakeholder input, ideate, reframe and suggest options to solve or address the problem, prototype solutions, test ideas, and make recommendations to inform implementation and ongoing measurement and monitoring of impact.
Restriction: Must have completed a minimum of 60 credits.
Additional Information: Selected class sessions will be on-site at local organizations such as Mona Clinic in Temple Hills, MD, HAIR Network shops in Hyattsville and the Sarvis Empowerment Cafe in Riverdale. The course also requires off-campus work at nearby locations.

HLSA601 Introduction to Health Systems (3 Credits)
An overview of the U.S. health care system using an interdisciplinary perspective. Students will learn about the financing, delivery, and use of healthcare in a historical, economic, and political context. An emphasis will be given to contemporary policy issues and debates, and there will be a focus on inequality within the U.S. health system.

HLSA611 Introduction to Health Equity (3 Credits)
The emerging field of health equity is concerned with understanding the causes and consequences of social disparities in population health. This course is designed to expose students to the foundational issues in health equity from a variety of perspectives. Through weekly meetings and discussion, students will develop familiarity with the major literature in the field of health equity. The course is divided into three sections: (1) Understanding Addressing Health Disparities; (2) Disparity Populations; and (3) Solutions in Health Equity. Students will gain understanding of the dimensions and sources of health inequality, including race/ethnicity, socioeconomic status, gender, nativity, and sexual minority status. Current policy debates and recent policy developments related to health equity are also briefly discussed.

HLSA688 Independent Study (1-6 Credits)
Master or doctoral students who desire to pursue special research problems under the direction of a faculty memeber of the department may register for 1-6 hours of credit under this number.
Prerequisite: Permission of SPHL-Health Services Administration department.
Repeatable to: 9 credits if content differs.

HLSA689 Field Work in Aging (1-6 Credits)
Individual instruction course.
Prerequisite: Permission of SPHL-Health Services Administration department.
Repeatable to: 6 credits if content differs.
Formerly: SPHL688.

HLSA702 Policy and Politics of Health (3 Credits)
Organizational and financial components of the U.S. health care system, including social and political forces that bind the system. Advanced political analysis of the health care system, including key issues and problems.

HLSA709 Graduate Seminar (1 Credit)
The purpose of the course is for doctoral students to present their work to fellow doctoral students and faculty in an informal and supportive environment. Faculty and students provide feedback and suggestions that are helpful to the presenting students. Several sessions each semester are for external speakers on interesting research topics.
Prerequisite: HLSA doctoral students.
Restriction: Must be HLSA doctoral student.
Repeatable to: 6 credits if content differs.

HLSA710 Healthcare Management: Foundations and Principles (3 Credits)
Concepts and managerial activities essential to achieve the goals of health care organizations are examined and discussed. Managerial processes include planning, decision-making, etc. required to operate and change health care organizations will be discussed. Special emphasis will be placed on the leader/managers role in developing and maintaining an effective system for providing healthcare.

HLSA711 Health Economics and Analysis (3 Credits)
Provides an analysis of health and health care services as economic goods. Using microeconomic theories, we will examine the behavior of health care providers, consumers, markets, and firms.

HLSA714 Economic Evaluation of Medical Care (3 Credits)
An overview of the theory and applications of cost-benefit analysis, cost-effectiveness analysis, and related forms of economic evaluation/decision analysis in the health care sector.
Prerequisite: HLSA601 and SPHL602; or students who have taken courses with comparable content may contact the department.

HLSA715 HSR Data Lab (1 Credit)
Introduces students to foundational skills in statistical programming and surveys data types and data sources commonly used in Health Services Research (HSR). Principals of statistical workflow and reproducibility are covered. The course focuses on programming in Stata, but also provides a very brief introduction to R and SAS.
Corequisite: HLSA725.

HLSA720 Health Law and Ethics (3 Credits)
The legal system helps determine the relationships prevailing among individuals, institutions and governments by setting out the rights, duties and powers of the various parties. This course will look at some of the more important concepts the law uses within the context of health services and public health.

HLSA721 Using Demographic Data for Health Policy Analysis (3 Credits)
The goal of this course is to introduce students to the major demographic data sets that are used in health policy research and to provide hands-on experience using these data to answer policy oriented research questions
Prerequisite: SPHL602; or students who have taken courses with comparable content may contact the department; or permission of instructor.
Additional Information: Priority enrollment will be given to students in the Department of Health Services Administration programs.

HLSA723 Health Policy Analysis and Advocacy (3 Credits)
Examination of the politics of the health policy process, including the effects of American political structure and institutions; economic and social factors; interest groups, classes, and social movements; media and public opinion, and other factors. The emphasis is both on understanding how public policy is made as well as how to influence the process.Students will learn about (1) how health policy is developed, adopted, and implemented, (2) the political, institutional, economic, social, and other factors that influence and shape the process, and (3) the basic approaches and tools of strategic advocacy.
Prerequisite: HLSA601.

HLSA724 Developing and Implementing Health Policy in Maryland (3 Credits)
Provides students with a thorough overview of Marylands health care policymaking process, including critical analysis of legislative, regulatory, financing, and delivery factors that shape health care policy. Examination of major current and ongoing health care policy issues in the state of Maryland. Students will be given the opportunity to receive briefings from key stakeholders who will offer their insights into complex and controversial health care policy issues in Maryland.
Prerequisite: Must have completed or be concurrently enrolled in HLSA601.

HLSA725 Econometrics in Public Health (3 Credits)
Empirical course to introduce students to econometric methods and their applications in public health.
Prerequisite: SPHL602; or students who have taken courses with comparable content may contact the department.
Additional Information: priority enrollment will be given to students at the School of Public Health.

HLSA727 Causal Inference in Health Services Research (3 Credits)
An overview of the conceptual and empirical tools used to infer causation in health and health care research. Advantages and limitations of experimental and quasi-experimental designs in health services research are discussed and students gain experience through applied exercises.
Prerequisite: HLSA725 or permission of instructor.

HLSA730 Healthcare Human Resources (3 Credits)
Provides an introduction to the management of human resources in the healthcare setting using basic human resources management doctrine common to all industries. Content includes principles and methods of personnel including employment, recruitment, selection, retention, training and development, compensation including wage and salary administration performance appraisal, job analysis and labor relations.

HLSA731 The Social Construction of Health and Health Service Delivery (3 Credits)
Dedicated to the social processes that shape health, health care seeking, health professions, and health care organizations. Students will learn how key concepts and theories from social epidemiology, medical sociology, organizational behavior, and management theory are integrated and applied to health services research. Readings will include a mix of theoretical and applied papers, and particular attention will also be paid to the research methods, study design, and construct measurement used in theory-informed research. The semester will culminate in a development of a theory-based empirical research proposal.
Prerequisite: HLSA601.
Restriction: Must be in a doctoral program; or permission from instructor .

HLSA732 The Evolving U.S. Health Care System (3 Credits)
Conducting policy-relevant health services research requires an in-depth understanding of the United States' evolving health care system. This class will provide an overview of ongoing and emerging challenges in health care financing, delivery, quality, and access. We will use theoretical tools from health services research to understand these trends, their driver, and their impacts.
Prerequisite: HLSA723.
Restriction: Must be in the Health Services Research PhD program; or permission from the instructor.

HLSA733 Topics in Health Care Reform (3 Credits)
An overview of the Patient Protection and Affordable Care Act of 2010 (ACA) and the major health care reforms explicitly included in the law, while also considering the state implementation decisions and provider innovation that has occurred over time due to the ACA is provided. It will address issues of implementation of Medicaid expansion, the state and federal Exchange, costs of care and efficiency, improving quality and patient safety as well as prevention and public health. We will discuss the actual process of passing the law, what compromises were made, the funding sources, recent changes, regulations, state decisions, waivers, and demonstration or pilot programs that have been developed and/or funded due to the law. We will also focus on the implementation of the law in Maryland, where the legislature and governor decided to expand Medicaid and create a state-based insurance exchange. However, the impacts of the law could be different in Maryland than in other states due to the population, moderate politics, and the presence of state price setting authority for hospitals and other providers.
Prerequisite: HLSA601, HLSA702, or HLSA711.

HLSA740 Healthcare Strategic Planning and Marketing (3 Credits)
An understanding of strategic management and marketing is provided which enables the students to lead the process of strategic planning in a healthcare organization. By conducting a marketing and strategic planning process, health care organizations are better able to cope with dramatic changes in technological, social, political, regulatory, and competitive aspects of the health care market. Strategic management enables organizations to identify issues unique to them, which hinder or promote organizational success. Through course readings, class discussions, analyses of secondary quantitative and qualitative data, and presentation of case studies, students gain a thorough understanding of the strategic management process. Students will apply core competencies through a comprehensive strategic and marketing plan. Plans will be defended through an oral presentation.

HLSA742 Quantitative Methods in Healthcare Administration (3 Credits)
The goal of this course is to give students the background needed to interpret and critique statistical methods and results encountered in the healthcare administrative field. In addition, this course will help students develop skills to conduct basic statistical analyses, become familiar with advanced functions in Excel, and acquire the ability to recognize, communicate, and answer health services related research questions.
Restriction: Must be in the Master of Health Administration program.

HLSA745 Public Health Practice and Management (3 Credits)
Examines the relationship of practice and management in performing essential public health services on local, state and national levels.

HLSA747 Health Care Management Research (3 Credits)
Introduces students to core research domains in health care management, including leadership; teams & teamwork; organizational change management & innovation; and quality improvement & patient safety; among others. The course will cover both foundational and recent literature, to prepare students to contribute to health care management research in their thesis or dissertation. Students will learn about the role of leaders in health care organizations, the clinical and operational teams they lead, the strategic goals these teams pursue, and the processes, technology, & innovation used to attain these goals. Students will develop skills in organizing peer-reviewed research in ways that facilitate the identification of important knowledge gaps. Students will produce a unique, defensible "map" of recent health care management literature and develop well-motivated research questions that address knowledge gaps and apply popular theoretical frameworks.
Restriction: Must be in Health Services Research PhD program; or permission of instructor.
Additional Information: Second-year MPH students (any concentration) may enroll conditional on instructor approval.

HLSA750 Healthcare Management Information Systems (3 Credits)
Provides a background and overview of the analysis, design, evaluation, selection, installation, use, and mangement of information systems in health care settings. Students will review the information management function and value of information and the role of information technology in the provision of high quality care and management decision making. Details on computer hardware, software, networking, and telecommunications sufficient for understanding of concepts relevant to health care managers and staff will be addressed.

HLSA760 Healthcare Financial Management (3 Credits)
Offers content in health services financial management with emphasis on applying traditional financial theories to health care and the health care system. Focus on decision-making using accounting and finance theories, principles, concepts and techniqes most important to health care leaders.

HLSA765 Dissertation Proposal Development Seminar (3 Credits)
Designed to support doctoral students prepare their dissertation proposal and oral presentation. The course is structured around a literature synthesis and development of a modified AHRQ R36 grant application which includes developing a research question and hypotheses, a conceptual model, specific aims, background and significance, and research strategy. The importance of communicating complex ideas through oral and written forms will be emphasized.
Recommended: Completed all coursework related to one's dissertation topic; and identified in collaboration with one's dissertation advisor a topic area and potential data set.
Restriction: Must be in Health Services Ph.D. (Doctoral) program; or permission of instructor. And must have passed departmental qualifying exam.

HLSA766 Foundational Readings in Health Services Research (3 Credits)
An overview of the foundational papers that inform health services research and its related disciplines; including literature on key conceptual models, classic empirical studies, and research illustrating cutting edge methods or findings. The major theoretical frameworks and empirical challenges of the field will be examined through critical reading and discussion among students. The course is organized around preparation for the qualifying exam in the Health Services Ph.D. program.
Prerequisite: Completion of the six HLSA Health Services Research core courses.
Restriction: Must be in Health Services Ph.D. (Doctoral) program.

HLSA770 Continuous Quality Improvement in Healthcare (3 Credits)
Designed for the health care professional or administrator involved in quality assurance in health care. Course includes historical beginnings, state-of-the-art, voluntary, governmental efforts, and tools to promote quality assurance.

HLSA772 Healthcare Leadership and Communications (3 Credits)
Health care administrators rely on transformational leadership skills and insights to help their organizations rise to the social financial, public health, and technological challenges of the future. Students will assess and develop their leadership strengths, apply key leadership communication principles, and critically analyze relevent leadership models, exploring their utility in addressing key leadership issues in health care organizations. An underlying theme will be the identification of core values involved in health care delivery, integration of those values in personal and organizational missions, and effective communication to stakeholders.

HLSA775 Health Services and Policy Research Methods (3 Credits)
Survey of health services and policy research methods, including conceptualization, measurement, survey sampling, literature review, different research designs, causal inference, data analysis, and interpretation of basic statistics. This is an introductory course in research methods designed for master's students in the School of Public Health.
Restriction: Must be in a major in SPHL-School of Public Health; or permission of instructor.

HLSA777 Program Evaluation Field Experience (3 Credits)
Program evaluation is a critical component in designing and operating effective programs. Organizations seek more accountability for the funds they provide to public or private projects. This course serves as an introduction to assessment methodology and evaluation tools commonly used in program evaluation. Students will gain practical experience through a series of exercises involving the design of a conceptual framework, development of indicators, and development of an evaluation plan to measure impact, and cost benefit/cost effectiveness analysis. The course will cover mixed methods research including qualitative and quantitative analysis, methodologies, and/or paradigms in a research study. Students will evaluate a community health program funded by the Maryland Community Health Care Commission (CHRC), and the Commission director will guide selection of the program.
Additional Information: Students will travel to the program site approximately three times to guide the evaluation design and collect data.

HLSA778 Practical Experience in Public Health (1-4 Credits)
Practical experience providing an opportunity to apply previously acquired knowledge and skills in a health or allied health organization. Setting of the experience will depend upon the student's background and career goals.
Prerequisite: Permission of SPHL-Health Services Administration department.
Repeatable to: 4 credits.
Credit Only Granted for: HLSA785 or HLSA778.

HLSA780 Qualitative Methods for Health Services Research (3 Credits)
This practice-based learning course will include orientation to the major paradigms in qualitative inquiry, developing research questions suitable for qualitative study, and an in-depth exploration of qualitative research methodologies and methods, particularly as they are applied in health services research. Students will collect, analyze, and present qualitative data using techniques learned in this course. The course will provide students with the foundational skills to conduct their own qualitative studies.
Credit Only Granted for: HLSA780 or HLTH625.

HLSA785 Internship in Public Health (3 Credits)
Internship and seminar providing an opportunity to apply previously acquired knowledge and skills in a health or allied health organization. Setting of the internship will depend upon the student's background and career goals.
Prerequisite: Permission of SPHL-Health Services Administration department.
Credit Only Granted for: HLSA785 or HLSA778.

HLSA786 Capstone Project in Public Health (3 Credits)
Capstone experience provding opportunity to apply knowledge and skills to a specific public health problem or issue. Completion of project relevant to public health under the direction of an advisor.
Prerequisite: Permission of SPHL-Health Services Administration department.

HLSA787 Health Equity Practice, Policy, and Research (3 Credits)
The objective of this course is to introduce students to the role of key stakeholders, including health care systems/organizations, governmental agencies/entities, and community-based organizations in advancing health equity to improve population health. Students will develop a set of foundational practices that centers health equity and social justice to develop, understand, evaluate, analyze, and apply health equity strategies in practice settings. This class is designed to build the capacity of students to translate theory into action and support a dynamic process of learning.
Restriction: Must be in a graduate major in SPHL-School of Public Health; or permission of instructor.

HLSA788 Critical Readings in Health Services Research (3 Credits)
Current and classic readings and research on various aspects of the health services research including the health care system, health care policy and social science research on health (including economics, psychology, political science, sociology etc.). The readings will be critically analyzed and applied to students research and current research as well as applications to health services research issues.
Repeatable to: 9 credits if content differs.

HLSA790 Advanced Methods in Health Services Research (3 Credits)
Provides an in-depth examination of health services research literature with emphasis on methodological scrutiny and application of methods beyond linear regression such as categorical regression, survival analysis, selection issues, and endogeniety.
Prerequisite: SPHL602; or permission of instructor.

HLSA798 HLSA Journal Club (1 Credit)
The course will highlight current topics in health services research. Outside speakers will present their research in a few of the classes. For the other classes, graduate students in the HLSA programs will select important and timely articles that they will present to the class for discussion in an informal setting.
Restriction: Must be HLSA graduate student.
Repeatable to: 8 credits if content differs.

HLSA799 Master's Thesis Research (1-6 Credits)

HLSA898 Pre-Candidacy Research (1-8 Credits)

HLSA899 Doctoral Dissertation Research (1-8 Credits)

HLTH - Health

HLTH402 Disability is Not an Outcome: An Introduction to Understanding Disability (3 Credits)
With an intent to disrupt traditional understandings of disability as a health outcome to be prevented, this course will introduce students to disability as an identity, a community, a population of interest to public health professionals. To change this understanding students will explore historical representations of disability, ableism, and lived experiences of people with disabilities. Disability is a multi-layered concept that broadly describes a wide range of people. Although geared toward public health scholars, the mix of readings, discussions, and assignments will help students reflect and integrate learning into their own fields of study. The course examines factors that led to systemic oppression, and methods and strategies of moving toward a more inclusive society.

HLTH410 Honors Seminar (3 Credits)
Undergraduate majors with a strong academic record are provided the opportunity to engage in challenging educational experiences related to the social and behavioral aspects of public health. Students will learn the skills and knowledge to develop, propose, defend, and complete an honors thesis or honors project.
Prerequisite: HLTH200; and must have completed 2 other courses in HLTH.
Restriction: Minimum cumulative GPA of 3.5; and must have completed 45 credits before applying.

HLTH420 Effective Strategies for Public Health Practice (3 Credits)
The purpose of this course is to present the interrelationships of curriculum planning, methodology and the selection and use of successful public health presentation strategies. Special problems associated with public health presentations are discussed, and students become familiar with a variety of resources as well as with planning for and implementing demonstration presentations.
Prerequisite: Minimum grade of C- in HLTH140 and HLTH230; and must have completed with a minimum grade of C- or be concurrently enrolled in HLTH212.
Restriction: Must be in the Public Health Practice program.

HLTH424 Lesbian, Gay, Bisexual & Transgender Health (3 Credits)
The preparation of students to be knowledgeable advocates for the health of lesbian, gay, bisexual, and transgender (LGBT) populations. Course focus is defined by the Healthy People 2020 federal health objectives for LGBT populations: data collection for research, culturally competent healthcare, bullying in schools, suicide, homelessness, and sexually transmitted diseases including HIV.
Recommended: Students should have some familiarity with basic psychology, sociology and/or epidemiology.
Restriction: This course is restricted to students who have completed a minimum of 60 credits. Jointly offered with HLTH624.
Credit Only Granted for: HLTH424 or HLTH6 24.

HLTH430 Health Education in the Workplace (3 Credits)
A survey of the role of health education in work settings. Examination of occupational stress, the health effects of shift work, women's health in the workplace, health education approaches to informing workers and management, and health promotion programs in the workplace.

HLTH431 Health Literacy in Action (3 Credits)
This course introduces the concept of health literacy and develops the knowledge and skills to understand the field and engage productively about health literacy with healthcare providers, systems, and policy makers. The class explores diverse perspectives about health information and communication, and different pathways and strategies to help create the conditions for more informed and engaged individuals and communities.
Recommended: HLTH371; or equivalent.
Credit Only Granted for: HLTH431 or GBHL310 .

HLTH432 Medical Terminology (3 Credits)
Provides the framework for understanding medical language and terminology used by health care professionals. Students will gain an understanding of the rules of building and analyzing medical terms from word origins and will learn correct pronunciation, definitions, and spelling for all of the body systems, major pathological conditions, common disorders, prescribed medications, and more. Whether a student is interested in learning more about the medical field or they want to acquire practical knowledge for future personal use, this course provides the foundation for understanding the language of medicine.
Credit Only Granted for: HLTH432 or HLTH498T.
Formerly: HLTH498T.

HLTH434 Introduction to Public Health Informatics (3 Credits)
Provides an overview of the field of public health informatics and the influence of technology on the public's health and well-being. Emphasizes the application of various technologies and computer/internet applications to support public health research and practice, including strategies to address new and emerging threats.
Restriction: Must be in one of the following programs (Public Health Practice; Public Health Science) ; and must have earned a minimum of 60 credits.
Credit Only Granted for: HLTH434 or HLTH498E.
Formerly: HLTH498E.

HLTH452 Global Health and Social Justice (3 Credits)
Evaluates the relationship between social justice and population health through critical discourse analysis of social determinants of health and applications of community-based methods for reducing population health inequities within and across national borders. The class aims to stimulate students' critical analysis to identify, describe, measure and apply consequences of injustices in population ill-health exposures and practices (policies, interventions and services). Students will apply critical thinking about how social injustices create preventable health disparities, unequal social determinants, poor environmental exposures and diseases among vulnerable populations in much of low-income countries.
Jointly offered with: HLTH602.
Credit Only Granted for: HLTH452 or HLTH602.

HLTH460 Multicultural Population Health (3 Credits)
Health concerns of U.S. ethnic minority groups and factors placing them at elevated risk for disease and injury. Health education concepts and strategies to reduce disparities between their health status and the health status of the general population.
Prerequisite: HLTH140, HLTH230, or HLTH366; or permission of SPHL-Behavioral & Community Health department.
Restriction: Must be in a major within the SPHL-Behavioral & Community Health department; or must be in the Anti-Black Racism Minor.

HLTH471 Women's Health (3 Credits)
The women's health movement from the perspective of consumerism and feminism. The physician-patient relationship in the gynecological and other medical settings. The gynecological exam, gynecological problems, contraception, abortion, pregnancy, breast and cervical cancer and surgical procedures. Psychological aspects of gynecological concerns.
Cross-listed with: WGSS471.
Restriction: Must be in a program in the Harriet Tubman Department of Women, Gender, and Sexuality Studies; or must be in a major within SPHL-Behavioral & Community Health department.
Credit Only Granted for: HLTH471, WMST471, or WGSS471..
Formerly: WMST471.

HLTH489 Field Laboratory Projects (1-6 Credits)
A course designed to meet the needs of persons in the field with respect to workshop and research projects in special areas of knowledge not covered by regularly structured courses.
Repeatable to: 6 credits.

HLTH490 Professional Preparation in Community Health (3 Credits)
The development of skills necessary for joining the public health work force post-graduation, as well as assistance in obtaining an appropriate internship that will serve as a final semester, capstone experience. Students will be exposed to various relevant professional experiences, and will be afforded the opportunity to strengthen their own individual skills by selecting from a menu of skills-based learning modules that best suit their perceived needs.
Prerequisite: Minimum grade of C- in EPIB301, EPIB315, SPHL100, HLTH124, HLTH140, HLTH200, HLTH230, HLTH302, BSCI170, BSCI171, and BSCI201; and students must have completed or be concurrently enrolled in HLTH364.
Corequisite: HLTH391.
Restriction: Must be in a major within the Behavioral and Community Health department.

HLTH491 Community Health Internship (12 Credits)
Integrating theory with practice in a community health setting.
Prerequisite: Minimum grade of C- in HLTH 391 and HLTH490; all other program requirements must be completed.
Restriction: Must have completed all program requirements and be in the last semester of the Public Health Practice degree program.

HLTH492 BS/MPH Community Health Internship (9 Credits)
Integrating theory with practice in a community health setting.
Prerequisite: Minimum grade of C- in HLTH490.
Restriction: Must be a Public Health Practice major who has been admitted to the combined BS/MPH degree program.

HLTH498 Special Topics in Health (3 Credits)
Topics of special interest in areas not covered by regularly scheduled courses.
Repeatable to: 6 credits if content differs.

HLTH602 Global Health and Social Justice (3 Credits)
Evaluates the relationship between social justice and population health through critical discourse analysis of social determinants of health and applications of community-based methods for reducing population health inequities within and across national borders. The class aims to stimulate students' critical analysis to identify, describe, measure and apply consequences of injustices in population ill-health exposures and practices (policies, interventions and services). Students will apply critical thinking about how social injustices create preventable health disparities, unequal social determinants, poor environmental exposures and diseases among vulnerable populations in much of low income countries.
Jointly offered with: HLTH452.
Credit Only Granted for: HLTH452 or HLTH602.

HLTH609 Public Health Journal Club (1 Credit)
Includes discussion of recent literature from leading peer-reviewed journals on a specific psychosocial construct and health outcome, with students presenting two articles during the semester. The purpose of this course is to read and consider health constructs and outcomes from a multidisciplinary perspective.
Restriction: Must be in the Behavioral & Community Health doctoral program; or be an advanced MPH student; and permission of Behavioral and Community Health department; or permission of instructor.
Repeatable to: 4 credits.

HLTH624 Advanced Lesbian, Gay, Bisexual & Transgender Health (3 Credits)
The preparation of students to be knowledgeable advocates for the health of lesbian, gay, bisexual, and transgender (LGBT) populations. Course focus is defined by the Healthy People 2020 federal health objectives for LGBT populations: data collection for research, culturally competent healthcare, bullying in schools, suicide, homelessness, and sexually transmitted diseases including HIV.
Recommended: Students should have some familiarity with basic psychology, sociology and/or epidemiology.
Credit Only Granted for: HLTH424 or HLTH624.

HLTH625 Community Assessment through Qualitative Methods (3 Credits)
A discussion of major paradigms in qualitative inquiry, an overview of the process of qualitative research, and an introduction to several qualitative research methods, including grounded theory, ethnography, phenomenology, and content analysis. Students will collect, transcribe, analyze, and present qualitative data using introductory interview and analytic techniques.
Restriction: Course will be restricted to Behavioral and Community Health graduate students.

HLTH631 Teaching PreK-8 Health Education (3 Credits)
Students will learn aspects of teaching preK-8 health education including: characteristics of preK-8 students, testing, grading, teaching lifetime skills, and effective teaching techniques using SHAPE America Standards. Students will engage in building instructional lesson plans for health education students in preK-8 grades.

HLTH632 Teaching in High School Health Education (3 Credits)
Students will learn aspects of teaching high school health education including: characteristics of high school students, testing, grading, teaching lifetime activities, and effective teaching techniques using SHAPE America Standards. Students will engage in building instructional lesson plans for health education students in high school.

HLTH635 Leadership in Crisis: Lessons from Select Public Health Issues (3 Credits)
Examine leadership successes and failures during the twin pandemics of COVID-19 and structural racism in the United States in 2020. Define a public health crisis and explore characteristics of highly functioning leaders during crises. Critically analyze current literature on leadership during these twin pandemics. Explore ways in which leaders adapt their own behavior and mobilize their workforce to respond to their constituencies to address crises. Students will critically analyze the performance of a current public health leader in a case study.

HLTH652 Quantitative Research Methods I in Public health (3 Credits)
Intermediate statistics and procedures in public health-related research for doctoral students. Focuses on applied statistics rather than theoretical, with emphasis on 1) how to apply statistical models, 2) how to perform the analysis with available software, and 3) how to interpret findings.
Prerequisite: HLTH710.
Restriction: Must be in PhD program in Behavioral and Community Health.

HLTH653 Quantitative Research Methods II in Public Health (3 Credits)
Intermediate and advanced statistics and procedures in health-related research for doctoral students with the focus on applications of these statistical methodological methods to public health research.
Prerequisite: HLTH652.
Restriction: Must be in a major within SPHL-Behavioral & Community Health department.
Credit Only Granted for: HLTH653 or HLTH688T.
Formerly: HLTH688T.

HLTH654 Communicating in Public Health Leadership (3 Credits)
Offers students an opportunity to understand public health leadership communication in various sectors, assess best practices in public health leadership communication, and how to implement these concepts in public health leadership communication to develop a confident and culturally aware voice. The overall aims of the course are to: (a) determine the different organizational communication forms in public health leadership; and (c) practice communication strategies to inform, engage, and persuade individuals within and outside of the organizational structure on various public health issues.
Recommended: HLTH671.

HLTH665 Health Behavior I: Theoretical Foundations of Health Behavior (3 Credits)
The purpose of this course is to provide the student with an understanding of how the social and behavioral sciences are applied to health. We will address behavioral, social and cultural factors that influence health and health disparities over the life course. Public health issues related to individuals and populations will be examined in terms of social and behavioral theories, empirical research findings, and methodologies.

HLTH666 Health Behavior II: Applying Health Behavior Theory (3 Credits)
Develops students' expertise in applying health behavior theory, with an emphasis on cultural appropriateness and through a social justice lens. This course will build on material learned in HLTH 665, and will involve a particular emphasis on application of health behavior theory. The course will be taught using a "hands-on" approach, giving students a skill foundation in applying health behavior theories throughout the life course of an intervention from the research question and hypothesis, to intervention development, and evaluation.
Prerequisite: HLTH665.

HLTH668 Teaching Internship in Health Education (1-6 Credits)
The MCERT Health Education internship is an intense experience that immerses interns into the life of their assigned Prek-12 school. The internship experience is designed to provide our pre-service teachers with a rich opportunity to learn the craft of teaching through close observation of experts as well as practice in the planning, delivery and assessment of instruction.
Restriction: Must be enrolled in Pre-K to 12 Health Education Master of Education program.
Repeatable to: 6 credits.

HLTH671 Public Health Communication (3 Credits)
This introductory graduate course in public health communication will examine basic concepts, theoretical foundations and behavioral and social scientific research and practice in the field of public health communication to gain an understanding of how health communication interventions, messaging, programs, etc. can contribute to improving health outcomes, eliminating health disparities, and achieving health equity. We will examine these concepts through the application and review of cultured-centered health communication approach and other health communication approaches and theories that can be applied to address specific health communication challenges (i.e. ineffective patient-provider communication, algorithm bias, etc.).
Restriction: Non-SPH students must obtain permission from the instructor prior to registering.

HLTH672 Public Health Informatics (3 Credits)
A basic overview of Informatics and its application in a public health setting. The major goal is for students to understand the basic tools and building blocks needed to utilize this technology in order to improve their professional productivity
Cross-listed with: EPIB672.
Restriction: Instructor permission is required for students not enrolled in a degree seeking program in the School of Public Health.
Credit Only Granted for: HLTH670 or HLTH672 or EPIB672.
Formerly: HLTH670.

HLTH674 Health Literacy (3 Credits)
This course introduces graduate students in public health and communication to health literacy research and evaluation methods. Students will learn health literacy methods that can be used at the individual, organizational, community, and population levels, and how to apply them to evaluate and design health information/content, including text, graphics, and numbers. Students will examine and critique how these methods have been applied; identify methodological gaps and opportunities for adapted or new methods. Students will participate in methods applications, create several health materials, and write short methods papers to demonstrate their knowledge and understanding.
Recommended: Health communication, communication, journalism, literacy, or cognitive or information sciences classes.

HLTH676 Co-Designing Digital Health Solutions (3 Credits)
Explores how digital health tools benefit consumers by advancing health equity and improving health outcomes. While these tools offer significant benefits, not all digital health solutions consider the diverse lived experiences of consumers, which can affect engagement and retention. By applying co-design approaches in digital health development, tools can better meet the preferences, needs, and experiences of consumers, leading to increased engagement and retention. Grounding the design process in an antiracist, inclusive, and equity (AREI) framework ensures that these tools are accessible and culturally relevant to all users, addressing disparities and promoting equitable outcomes. Throughout the course, students will review common co-design approaches in digital health, explore AREI frameworks that inform the design process, and apply these principles in co-designing a digital health tool with community members.
Recommended: HLTH710, HLTH665, HLTH671, and HLTH674.
Restriction: Must be in a Maryland School of Public Health program; or permission of the instructor.

HLTH678 Professional Seminar for Teacher Development in Health Education (3 Credits)
The spring seminar course is an extension of the fall seminar course and spring internship course. It accompanies a full time undergraduate level teaching internship and is intended to support and extend students' field experience learning. The spring seminar course is designed to continue to provide students with the support they need to successfully meet the College of Education's Health Education programmatic requirements and the Maryland State Department of Education's PreK-12 Health and Physical Education Teacher Certification Requirements. These requirements include demonstrating mastery on all of the College of Education's Foundational Competencies (FCCs) and Performance Based Assessments (PBAs) and the national edTPA, InTASC, Health Education Teacher Education Standards (HETE) and MSDE and SHAPE America Standards.
Restriction: Must be in the MCERT Health Education program.
Repeatable to: 3 credits.

HLTH688 Special Problems in Health Education (1-6 Credits)

HLTH701 Mixed Methods in Behavioral and Community Health Research (3 Credits)
A discussion of major paradigms in mixed method inquiry, an overview of the process of mixed methods research, and an introduction to several mixed methods approaches, including convergent, explanatory sequential, and exploratory sequential designs.
Prerequisite: HLTH625 and HLTH710, or equivalent non-BCH qualitative and quantitative methods courses.

HLTH709 Public Health Research Journal Club (1 Credit)
Discussion of recent research literature from top peer-reviewed journals focusing on cutting edge research issues related to public health. Examines public health research issues and their relationship to the conduct and application of public health practice.
Restriction: Must be in Ph.D.: Public and Community Health (Doctoral) program; or must be an advanced MPH Behavioral and Community Health student; or permission of instructor.
Repeatable to: 4 credits.

HLTH710 Methods and Techniques of Research (3 Credits)
This course provides an overview of research design and methods related to behavioral and community health outcomes. The primary goal of the course is to make you an informed creator and consumer of research in public health, specifically behavioral and community health. In developing these skills, we will examine the role and importance of the scientific method, identify relevant ethical issues surrounding social science research, explore issues regarding 1) measurement operationalization and validity, 2) sampling and external validity, and 3) the strengths and weaknesses of a variety of research designs and how they related to internal (causal) validity.

HLTH711 Advanced Research Methods in Health (3 Credits)
Quantitative techniques, advanced research methods and design issues.
Prerequisite: HLTH710.
Restriction: Must be in MPH: Community Health Education (Master's) program; or must be in Ph.D.: Public and Community Health (Doctoral) program.

HLTH712 Applied Research Methods in Behavioral and Community Health (3 Credits)
Designed to build on the research skills obtained in HLTH710 and other fundamental research methods and statistics courses. Methods and problems that are commonly encountered in health education research will be discussed including examination of actual research studies. Complex behavioral research issues will be addressed with existing research data sets. With these data sets, students will develop an analytic plan and conduct data analysis.
Prerequisite: HLTH710.

HLTH742 Professional Writing and Presentations (3 Credits)
Acquaints students with various types of professional writing required of public health professionals, including: grant proposals; journal articles; textbooks; presentation proposals and papers; and theses and dissertations. Includes both the form and content of technical documents as well as the processes of writing, peer review, and critique.
Restriction: Must be in MPH: Community Health Education (Master's) program; or must be in Ph.D.: Public and Community Health (Doctoral) program.
Credit Only Granted for: HLTH742 or HLTH688W.
Formerly: HLTH688W.

HLTH776 Community Health Program Evaluation (3 Credits)
An application of basic research methods, and the evaluation of community health programs. Students will evaluate the effectiveness of a community health intervention.
Prerequisite: HLTH710 and HLTH774.
Restriction: Must be in the Behavioral and Community Health (BCHL) doctoral program; and permission of Behavioral and Community Health department; or permission of instructor.
Credit Only Granted for: HLTH775 or HLTH774 and HLTH776.
Formerly: HLTH775.

HLTH778 Practical Experience in Public Health (1-4 Credits)
Practical Experience seminar providing an opportunity to apply previously acquired knowledge and skills in a health or allied health organization. Setting of the practical experience will depend upon the student's background and career goals.
Prerequisite: SPHL601, SPHL602, SPHL603, SPHL610, SPHL611, HLTH665, HLTH672, and HLTH780.
Restriction: Must be in the Master of Public Health: Behavioral and Community Health concentration in-person or online program (MBCH or MBCO); and permission of Behavioral and Community Health department.
Repeatable to: 4 credits.
Credit Only Granted for: HLTH785 or HLTH778.

HLTH780 Community Health (3 Credits)
The purpose of this course is to provide an overview of key community health organizations, principles and processes. Students will learn how to apply various models of community needs assessment and how to use intervention frameworks in program development.
Restriction: Must be in the Behavioral and Community Health doctoral program (BCHL) or the Master of Public Health Behavioral and Community Health concentration in-person or online program (MBCH or MBCO); and permission of Behavioral and Community Health department.

HLTH781 Implementing Equitable Community Engagement for Sustainable Health Outcomes (3 Credits)
Students will be prepared to lead effective community engagement initiatives. The curriculum covers various methods, culminating in the ability to develop comprehensive engagement plans for intervention design, implementation, and evaluation. Key components include designing a community organizing campaign and critically analyzing the role of positionality in successful engagement.
Prerequisite: HLTH780; or permission of instructor.
Restriction: Must be in the Master of Public Health Behavioral and Community Health Concentration; or permission of instructor.

HLTH784 Guided Capstone Preparation Seminar (1 Credit)
The purpose of this seminar is to guide students through the major steps and deadlines associated with developing their capstone project, which is the MPH degree culminating experience. The capstone project requires that students apply the knowledge and skills acquired during their MPH program to meet the needs of a stakeholder group or person. Some examples of needs (deliverables) include: an infographic, a website, a curriculum, a lesson plan, an app, an evaluation plan, a policy brief, etc. Some examples of stakeholders: include legislators, non-profit organizations, a faculty researcher, a government (county, state or federal) agency, etc. The project is very applied in nature and the result is a deliverable that can be used immediately by the stakeholder.
Prerequisite: Must have attended a capstone project orientation session; and must have completed or be concurrently enrolled in HLTH625, HLTH665, and HLTH710.

HLTH785 Internship in Public Health (3 Credits)
Internship and seminar providing an opportunity to apply previously acquired knowledge and skills in a health or allied health organization. Setting of the internship will depend upon the student's background and career goals.
Prerequisite: HLTH665, HLTH775, and HLTH780; or permission of SPHL-Behavioral & Community Health department.
Credit Only Granted for: HLTH785 or HLTH778.

HLTH786 Capstone Project in Public Health (2-3 Credits)
Capstone experience providing opportunity to apply knowledge and skills to a specific public health problem or issue. Completion of project relevant to public health under the direction of an advisor.
Prerequisite: Must have completed all required coursework; and permission of SPHL-Behavioral & Community Health department.
Restriction: Must be in a major within SPHL-Behavioral & Community Health department.

HLTH799 Master's Thesis Research (1-6 Credits)

HLTH898 Pre-Candidacy Research (1-8 Credits)

HLTH899 Doctoral Dissertation Research (1-8 Credits)

IMMR - Immigration Studies

IMMR400 Vital Voices: Oral Histories of the Immigrant Experience (3 Credits)
An exploration of the dynamic subject of U.S. immigrant experience through the scope of individual immigrant life stories in a global context. Course will include an overview of U.S. and global immigration patterns and an introduction to the practice of oral history.
Recommended: HIST222; or IMMR200.
Credit Only Granted for: HIST428N, IMMR400, THET428I, or THET498V.
Formerly: HIST428N.

IMMR419 Special Topics in Immigration and Migration Studies (3 Credits)
Thematic exploration of a topic in immigration or migration studies history with emphasis on understanding how the movement of people is relevant in the contemporary world.
Repeatable to: 6 credits if content differs.

INFM - Information Management

INFM600 Information Management Ecosystems (3 Credits)
Explore models and methodologies used to create, collect, process, present, store, and distribute data, information, and knowledge in a variety of settings, including individuals, groups and teams, organizations, communities, platforms and ecosystems, governments, and society. Specific topics explored in this course include but are not limited to information behavior, mental models, process modeling, data modeling, data preprocessing, descriptive statistics, information visualization, computer-supported cooperative work, media richness, enterprise systems, online communities, communities of practice, digital platform ecosystems, open data, civic informatics, smart cities, data science for social good, hype cycle, and technology landscape.
Restriction: Permission of INFO-College of Information Studies.

INFM603 Information Technology and Organizational Context (3 Credits)
Application of communication and information technologies to support work processes, including technology-enhanced communication networks, computer-supported collaborative work, decision-support systems, interactive systems, and systems analysis. Acquisition of information systems and their integration into the organization.
Restriction: Must not have completed LBSC671 or LBSC690; and permission of INFO-College of Information Studies.

INFM605 Users and Use Context (3 Credits)
Use of information by individuals. Nature of information. Information behavior and mental models. Characteristics of problems, task analysis, problem solving, and decision making. Methods for determining information behavior and user needs. Information access. Information technology as a tool in information use.

INFM612 Management of Information Projects, Programs, and Services (3 Credits)
An introduction to fundamental and leading-edge management theories and practices, and provides opportunities to develop and apply essential skills that professionals need to participate in, manage, or lead information projects, programs, and services in modern organizations, communities, and society. Specific topics explored in this course pertain to management environments (e.g., organizational culture, professional ethics, and social responsibility) and core management functions such as planning (e.g., mission and vision, goal setting, strategy, and decision making), organizing (e.g., organizational design, innovation and change management, and human resource management), leading (e.g., leadership and motivation), and controlling (e.g., quality control, budgeting, performance evaluation).
Restriction: Permission of INFO-College of Information Studies.

INFM620 Introduction to Strategic Information Management (3 Credits)
Strategic management is the comprehensive collection of tasks, activities, and processes organizations use to coordinate and align resources and actions with its mission, vision, and strategy. Due to changes occurring in our global landscape, the integration of business and technology is compelling organizations to move beyond traditional, reactive, and silo-based data management approaches to a managed, predictive approach that treats information as a strategic asset and uses it to create business value. To meet challenges of this hyper-competitive environment, this course will provide you with an introduction to the strategic management of information assets for competitive differentiation and sustained business success.
Prerequisite: INFM612; or LBSC631; or permission of instructor.
Restriction: Permission of INFO-College of Information Studies.

INFM700 Information Architecture (3 Credits)
Principles and techniques of information organization and architecture for the Web environment. Structured description of digital resources, including data modeling techniques, metadata schemes, and user-oriented navigation systems.
Prerequisite: INFM603; or permission of instructor.
Restriction: Permission of INFO-College of Information Studies.

INFM718 Selected Topics in Information Management (1-3 Credits)
Selected topics in information management.
Repeatable to: 9 credits if content differs.

INFM719 Independent Study (1-3 Credits)
Intensive individual study under faculty supervision.
Restriction: Permission of instructor; and must be in Information Management (Master's) program; and permission of INFO-College of Information Studies.
Repeatable to: 6 credits if content differs.
Additional Information: Faculty permission and Independent Study Contract required.

INFM736 Information Management Experience (3 Credits)
The Information Management Capstone Experience I and II are the culminating experience of the Master of Information Management program, taken in the students final two semesters. The capstone experience provide students with the opportunity to integrate and synthesize the knowledge and skills acquired throughout their MIM course work while working in a real world Information Management project. These courses must be taken in succession.
Prerequisite: INFM600; and INFM612; and INFM605; and INFM603. Or permission of instructor.
Restriction: Must be in Information Management (Master's) program; and permission of INFO-College of Information Studies.

INFM737 Information Management Capstone Experience (3 Credits)
The Information Management Capstone Experience I and II are the culminating experience of the Master of Information Management program, taken in the students final two semesters. The capstone experience provide students with the opportunity to integrate and synthesize the knowledge and skills acquired throughout their MIM course work while working in a real world Information Management project. These courses must be taken in succession.
Prerequisite: Must have earned a minimum of 27 credits in the MIM Program; or permission of instructor.
Restriction: Must be in Information Management (Master's) program; and permission of INFO-College of Information Studies.

INFM799 Master's Thesis Research (1-6 Credits)
Intensive individual research course under the supervision of a faculty member.
Prerequisite: INST701; or permission of instructor.
Restriction: Must be in Information Management (Master's) program; and permission of instructor; and permission of INFO-College of Information Studies.
Repeatable to: 9 credits.

INST - Information Studies

INST401 Design and Human Disability and Aging (3 Credits)
Focuses on the design of consumer products and information systems to enable their use by persons with a wider range of physical, sensory, and cognitive abilities. Overviews aging and major types of impairment as they relate to resulting problems using consumer products and information systems. Focuses on principles of design of mass market products.
Prerequisite: Minimum grade of C- from INST362 or INST367.
Restriction: Must be in Technology and Information Design or Information Science programs.
Credit Only Granted for: INST408B or INST401.
Formerly: INST408B.

INST402 Designing Patient-Centered Technologies (3 Credits)
Companies have created a vast array of apps and other technologies for understanding managing personal health and wellness, but many of them have been created with little understanding of audience needs or potential ethical issues. Course introduces students to the unique challenges of studying people's health and wellness needs as well as designing and evaluating technologies to meet those needs.
Prerequisite: Minimum grade of C- from INST362 or INST367.
Restriction: Must be in Technology and Information Design or Information Science programs.

INST403 Computational Journalism (3 Credits)
Designed to teach the application of computational methods in journalism and reporting. The methods include natural language processing, visualization, and web data mining. The course will also cover the necessity and impact of journalistic ethics in designing computation solutions.
Prerequisite: Permission of the Philip Merrill College of Journalism.
Cross-listed with: JOUR473.
Jointly offered with: JOUR773.
Credit Only Granted for: JOUR479V, JOUR473, INST408I or INST403.
Formerly: JOUR479V and INST408I.

INST405 Game Design (3 Credits)
Games are a structured form of play that are typically undertaken for recreational--but sometimes also educational and even professional--purposes. But what constitutes a successful game? In this course, you will learn the fundamentals of game design: applying elements and principles of game design, such as goals, rules, and challenges to create games, such as board games, card games, and digital games. You will be introduced to the basic tools and methods of game design: paper and digital prototyping, design iteration, design critique, and user testing. As part of the course, you will be designing several games of different types. You will also learn how to use your skills to deconstruct and critique the components of existing games, as well as gain an understanding of the role of the game designer in real-world game development teams.
Prerequisite: Minimum grade of C- in INST126, STAT100 or INST201; and minimum grade of C- from PSYC100 or SOCY105.
Restriction: Must be in the Information Science program or Technology and Information Design program.
Credit Only Granted for: INST408J or INST405.
Formerly: INST408J.

INST406 Cross Disciplinary Design Communication Lab (3 Credits)
Explores the world of communicating the ideas behind the things we make. In design, the product tends to be the prize: a manifestation of experience, sensibilities, and observations. But products do not always articulate a complete picture of what they are and how they came to be. Communication--speaking, writing, depicting, presenting to various audiences--is an under-leveraged component of design, connecting the product with emotion, process, context, and most importantly, the audience.
Prerequisite: Minimum grade of C- in INST380; and a minimum grade of C- in Professional Writing General Education requirement.
Restriction: Must be in the Technology and Information Design program.

INST407 Leading and Sustaining a Culture of Innovation (3 Credits)
Successful leaders know that the key to value creation and sustained growth lies in innovation -- continuously seeking opportunities to create value whether by launching new products and services, entering new markets, or rethinking key processes. This course will focus on the most efficient leadership strategies, change management, team motivation, technology team management for information management within organizations. We will examine some of the best ways to foster innovative behaviors within a team and organization. Students will engage with a course-long culture change challenge.
Restriction: Must be in Technology Innovation Leadership minor; or permission of INFO-College of Information Studies.
Credit Only Granted for: INST408L or INST407.
Formerly: INST408L.

INST408 Special Topics in Information Science (1-6 Credits)
Selected topics in information studies.
Prerequisite: Minimum of a C- from (STAT100, MATH115 or higher); minimum of a C- from (INST126 or GEOG276); minimum of a C- from (PSYC100, SOCY105, or BSOS233).
Restriction: Must be in Information Science, Technology and Information Design, or Social Data Science program.
Repeatable to: 9 credits if content differs.

INST410 Managing with Data and Simulations (3 Credits)
General principles of modeling, data analysis, and decision-making methods. Approaches to evaluating and assessing effective concepts, methods, and procedures of modeling and data analysis for decision making in management, advocacy, and communication situations. Ethical considerations in management, advocacy, and communication situations in professional life.
Prerequisite: Minimum grade of C- in INST126 and STAT100; minimum grade of C- in PSYC100 or SOCY105; minimum grade of C- in INST201 or INST301; and minimum grade of C- in MATH115 or higher.
Restriction: Must be in the Information Science or Technology and Information Design programs.
Credit Only Granted for: INST408M or INST410.
Formerly: INST408M.

INST414 Data Science Techniques (3 Credits)
An exploration of how to extract insights from large-scale datasets. The course will cover the complete analytical funnel from data extraction and cleaning to data analysis and insights interpretation and visualization. The data analysis component will focus on techniques in both supervised and unsupervised learning to extract information from datasets. Topics will include clustering, classification, and regression techniques. Through homework assignments, a project, exams and in-class activities, students will practice working with these techniques and tools to extract relevant information from structured and unstructured data.
Prerequisite: Minimum grade of C- in MATH115 (or higher) and STAT100; and a minimum grade of C- from INST126 or GEOG276; and a minimum grade of C- from one of the following (INST201, INST301, or BSOS233); and a minimum grade of C- from one of the following (AASP101, ANTH210, ANTH260, ECON200, ECON201, GEOG202, GVPT170, PSYC100, or SOCY100); and a minimum grade of C- from BSOS233 or INST314.
Recommended: Minimum C- in MATH140 and (INST326, BSOS326, or GEOG376).
Jointly offered with: SDSI414.
Restriction: Must be in Information Science or Social Data Science program.
Credit Only Granted for: SDSI414 or INST414.

INST420 Data Applications in Global Health (3 Credits)
Explores the impact of data on global health research and practice. Identifies, analyzes and interprets health data on a global scale, and explores the distribution and utilization of data to impact public health outcomes. Topics include machine learning, geospatial analysis, data visualization and data ethics.
Prerequisite: Minimum grade of C- in EPIB315 or INST314; or other upper-level statistics course.
Recommended: GBHL200, SPHL100, or related coursework in global health, medical anthropology, or global politics and development.
Restriction: Must have earned a minimum of 60 credits.

INST422 Modeling and Simulating Systemic Problems (3 Credits)
General principles of systems thinking and feedback dynamics modeling. Approaches, methods, and tools for identifying, articulating, and addressing non-linear, feedback-driven, systemic problems. Approaches to evaluating and assessing systems thinking and feedback dynamics models. Ethical considerations in systems thinking and feedback dynamics modeling practice.
Prerequisite: Minimum grade of a C- in INST201, STAT100, and INST126; and minimum of a C- in PSYC100 or SOCY105.
Restriction: Must be in the Information Science, Technology and Information Design, or Global Health major.

INST423 AI Adoption Clinic: Values-Centered AI for Community Organizations (3 Credits)
Local governments and small organizations are increasingly adopting AI tools--but often without the expertise or resources to evaluate them. This course bridges that gap by giving students hands-on experience supporting real clients through The AI Clinic. Working in teams, students will analyze community "AI cases," assess potential tools, and identify benefits, risks, and ethical implications. Through these projects, students gain practical experience in responsible AI evaluation, procurement, and design for the public good.
Credit Only Granted for: INST423 or INST623.

INST437 Information Architecture (3 Credits)
An introduction to the fundamentals of information architecture and how it's used in the design of digital products and services and in cross-channel service design.
Prerequisite: INST352.

INST441 Digital Curation Ethics and Policy (3 Credits)
Explores via case studies the legal, ethical, and technological challenges in developing and implementing policies for managing digital assets and information. Emphasizes access questions pertinent to managing sensitive information and the roles and responsibilities of information professionals.
Prerequisite: Minimum grade of C- from INST341 or INST380.
Restriction: Must be in the Information Science program or Technology and Information Design program.

INST442 Digital Curation Across Disciplines (3 Credits)
Examines how to apply digital curation principles, tools, and strategies in managing diverse data collections and digital information in different disciplinary settings. Explores differences among data curation principles and practices across diverse settings, ranging from scientific organizations (such as business and academic research laboratories and computational science settings), to humanities-based institutions (such as cultural heritage organizations) to social science-based institutions (such as data-intensive professional environments).
Prerequisite: Must have completed with a C- or higher, or be concurrently enrolled in INST341 or INST380.
Restriction: Must be in the Information Science program or Technology and Information Design program.

INST443 Tools and Methods for Digital Curation (3 Credits)
Introduces students to the application of digital tools and methods in a variety of organizational settings, academic disciplines, and economic sectors.
Prerequisite: Must have completed with a minimum grade of C-, or be concurrently enrolled, in INST341 or INST380.
Restriction: Must be in the Information Science program or Technology and Information Design program.

INST447 Data Sources and Manipulation (3 Credits)
Examines approaches to locating, acquiring, manipulating, and disseminating data. Imperfection, biases, and other problems in data are examined, and methods for identifying and correcting such problems are introduced. The course covers other topics such as automated collection of large data sets, and extracting, transforming, and reformatting a variety of data and file types.
Prerequisite: Minimum grade of C- in STAT100 and INST327; and a minimum grade of C- from one of the following: (INST201, INST301, BSOS233); and a minimum grade of C- from one of the following: (AASP101, ANTH210, ANTH260, ECON200, ECON201, GEOG202, GVPT170, PSYC100, SOCY100, or SOCY105); and a minimum grade of C- from one of the following: (AASP210, ECON230, GEOG306, GVPT201, INST314, PSYC200, or SOCY201); and a minimum grade of C- from one of the following: (BSOS326, INST326).
Restriction: Must be in Information Science or Social Data Science program.

INST450 Introduction to CRM in Salesforce (3 Credits)
Students learn how to configure Salesforce so that they are able to collect, analyze and retrieve all of the vital information associated with their customer base. Moreover, students use Force.com fundamentals to understand Salesforce online application development and the deployment of next-generation cloud apps. The course offers practical hands-on learning that ensures students' job success as well as the theoretical knowledge needed to pass both Salesforce certification exams (ADM201 & Platform App Builder).
Prerequisite: INST327.
Credit Only Granted for: INST408P or INST450.
Formerly: INST408P.

INST451 Consumer Health Informatics (3 Credits)
Explores people's health-related information needs and whether, how, and why people seek out and use (or do not seek out and use) health information and the types of health information they find useful. We will also cover the important and interrelated topics of information avoidance, health behaviors, health literacy, digital health literacy, doctor-patient communication, and patient-to-patient communication through support groups and online communities. Throughout the course, we will also focus on the important concept of health justice - a world in which everyone has an adequate and equitable capability to be healthy.
Prerequisite: Minimum grade of C- in INST126 and STAT100; minimum grade of C- from PSYC100 or SOCY105; and minimum grade of C- from INST201 or INST301.
Restriction: Must be in the Information Science program or Technology and Information Design program.
Credit Only Granted for: INST408A or INST451.
Formerly: INST408A.

INST452 Health Data Analytics (3 Credits)
Health data analytics involves the extrapolation of actionable insights from patient data, using data sources such as electronic health records (EHRs), claims data, surveillance data, and surveys. Health data is complex, often unstructured and incomplete, and is organized for clinical care rather than to meet analytic needs. This course will involve the use of various analytical methods in order to translate large and complex data, whether structured or unstructured, into insights that improve decision-making from both the patient and provider perspectives. Healthcare data are rich and hold so much potential, but a challenge is presented to patients, providers, and even government agencies when it comes to figuring out how to leverage these data. Students in this course will learn foundational topics in data analytics focused on health data and will apply this knowledge to real health datasets through hands-on labs integrated into the lectures.
Prerequisite: Minimum grade of C- in INST126 or GEOG276; and minimum grade of C- in PSYC100 or BSOS233; and minimum grade of C- in STAT100 or MATH115 or higher.
Restriction: Must be in the Information Science program or Social Data Science program.

INST453 Project Management for Information Science (3 Credits)
Provides a comprehensive overview of project management, focusing on the needs of information resources (IR). The course covers the concepts and techniques for planning and execution of projects including developing work breakdown structure, estimating costs, managing risks, scheduling, staff and resource allocation, team building, communication, tracking, control, and other aspects of successful project completion.
Credit Only Granted for: BMGT485, ENCE320, ENCE325, INST408O or INST453.
Formerly: INST408O.

INST454 Project Development Studio (3 Credits)
Allows students to develop a self-selected project or product, such as a game UI system or a task management app, while building advanced design skills. Students bring an initial idea to the class, and through lectures, discussions, weekly critiques, and project milestones, they progress their concepts into tangible, public-facing work. Emphasizing industry-standard methodologies, the course focuses on three core activities: externalizing ideas, engaging in constructive critique, and documenting design decisions and progress. This hands-on approach fosters self-directed learning, collaborative reflection, and a comprehensive understanding of design and development.
Prerequisite: Minimum grade of C- in INST104, INST126, INST204, and INST380; and must have completed or be concurrently enrolled in INST367.
Restriction: Must be in the Technology and Information Design program.

INST455 Information Assurance and Compliance (3 Credits)
Examines the protection of organizational data, personalized information, intellectual property and the associated assurance of the data's transfer, storage and communication. Students will understand how to manage these concerns and respond to both emergent and existing threats within the information domain. We will look at the key principles of Information Assurance, compliance and best practices in the real world.
Credit Only Granted for: INST408U or INST455.
Formerly: INST408U.

INST456 Risk Management Leadership in the Information Age (3 Credits)
Helps students assess and mitigate a range of vulnerabilities within an organization's data networks, allowing them to understand how to protect the integrity, security, and confidentiality of information.
Credit Only Granted for: INST408B or INST456.
Formerly: INST408B.

INST457 Lean startup (3 Credits)
Understanding the innovation process, being a high-performing team member, and having hands-on experience with how to successfully transform an idea into a product or service that people want are critical to launch a business or social enterprise. This skill set is also in high demand by employers. In this class, you will become fluent in lean startup and design thinking principles to experience the entire startup cycle. You'll enjoy hands-on experience with the best practice methods and tools used in global innovation. You'll develop skills to pitch an idea, gain leadership skills to mobilize others, and navigate through difficult teamwork situations. You will benefit from the instructor's decades of experience launching successful for-profit ventures, and will be given an experienced entrepreneur as a mentor, and a lively, hands-on, and experiential style of teaching.
Credit Only Granted for: INST398E or INST457.
Formerly: INST398E.

INST461 Emerging Technologies and Risk Management (3 Credits)
Focuses on how people and companies can achieve various tangible and intangible benefits and assess risk in using and incorporating emerging technologies (i.e. mobile devices, social media, robotic process automation, 3-D printing, cloud computing, blockchain technologies, artificial intelligence, etc.) into the activities and operations of a company.
Credit Only Granted for: INST408Z or INST461.
Formerly: INST408Z.

INST462 Introduction to Data Visualization (3 Credits)
Exploration of the theories, methods, and techniques of visualization of information, including the effects of human perception, the aesthetics of information design, the mechanics of visual display, and the semiotics of iconography.
Prerequisite: Minimum grade of C- in STAT100; minimum grade of a C- from one of the following (INST201, INST301, or BSOS233); minimum grade of C- in INST126 or GEOG276; a minimum grade of C- from one of the following (AASP101, ANTH210, ANTH260, ECON200, ECON201, GEOG202, GVPT170, PSYC100, SOCY100, or SOCY105); and a minimum grade of C- from BSOS233 or INST314.
Restriction: Must be in Information Science or Social Data Science program.

INST463 Technology Socialprenuer (3 Credits)
Introduces students to the role of technology and entrepreneurship in our society. Students will be able to choose an existing society issue and develop creative entrepreneurial ideas to solve it using innovative technologies. The course allows students to meet industry professionals and learn more about various social problems and projects companies focus on and try to solve in the modern world. Students are also able to contribute to those solutions.
Credit Only Granted for: INST398B or INST463.
Formerly: INST398B.

INST464 Decision Making for Cybersecurity (3 Credits)
Discusses human and organizational decision making from a variety of perspectives. Applies different risk assessment and decision making frameworks that are relevant to personal and organization cybersecurity, with a focus on the quantitative Factor Analysis of Information Risk (FAIR) model. Considers monetary, social and societal costs of cybersecurity decisions. Considers a range of questions relating to cybersecurity, from whether to install a game on a smartphone to how to allocate scarce information security resources in an organization.
Prerequisite: Must have earned a minimum grade of C- in INST201, INST126, MATH115, PSYC100, and INST364.
Restriction: Must be in Information Science program.
Credit Only Granted for: INST408W or INST464.
Formerly: INST408W.

INST466 Technology, Culture, and Society (3 Credits)
Individual, cultural, and societal outcomes associated with development of information & communication technologies (ICTs), including pro- and anti-social factors. Unpacking how gender, race, ethnicity, sexual orientation, disabilities, and political affiliations affect consumption and production of online experiences. Unpacking how structures of dominance, power and privilege manifest at individual, institutional and cultural levels.
Prerequisite: Minimum grade of C- in INST201 or INST301; and minimum grade of C- in PSYC100 or SOCY105.
Restriction: Must be in the Information Science program or Technology and Information Design program.

INST467 Fundamentals of Cybersecurity for Policy Makers (3 Credits)
Explores the key issues facing policy makers attempting to manage the problem of cybersecurity from its technical foundations to the domestic and international policy considerations surrounding governance, response, critical infrastructure risk management, and privacy. Designed for students with little to no background in information technology, and will provide the principles to understand the current debates shaping a rapidly evolving security landscape.
Prerequisite: Must have completed with a C- or be concurrently enrolled in INST364.
Restriction: Must be in Information Science program.
Credit Only Granted for: INST408V, PLCY388C, or INST467.
Formerly: INST408V.

INST470 Competitive Business Intelligence (3 Credits)
Competitive intelligence (CI) is a derivative of governmental intelligence, as well as business marketing, economics, and management, that is defined similarly: the collection, evaluation, analysis, and application of legally available information relevant to the plans, decisions, and operations of one's organization. Topics will include an overview and comparison of the intelligence process in government and in business (i.e., the intelligence cycle), a detailed consideration of the requirements and the analytical segments of that process, a survey of current analytical tools, a survey of information sources and information acquisition activities, a survey of required personnel, physical and information security policies, and the necessary efforts in creating an effective CI unit within any business enterprise.
Credit Only Granted for: INST408K or INST470.
Formerly: INST408K.

INST480 Technology Design Ethics (3 Credits)
Recent years have seen increasing attention to technology design ethics: the steps necessary to ensure that technologies support (and don't undermine) human values, human rights, and human flourishing. But what ethical design looks like can vary based on contexts, industries, and individual workplaces. This course will explore, critique, and expand on tools meant to prioritize ethics in technology workplaces. We will experiment with, assess, and then create our own checklists, toolkits, games, and other creative interventions to make ethical conversations central to technology design.
Prerequisite: Must have completed or be concurrently enrolled in INST204.

INST490 Integrated Capstone for Information Science (3 Credits)
The capstone provides a platform for Information Science students where they can apply a subset of the concepts, methods, and tools they learn as part of the Information Science program to addressing an information problem or fulfilling an information need.
Prerequisite: Minimum grade of C- in INST311, INST314, INST326, INST327, INST335, INST346, INST352, and INST362.
Jointly offered with: INST491, SDSI492.
Restriction: Must be in Information Science program; and must have earned a minimum of 90 credits; and permission of INFO-College of Information Studies.
Credit Only Granted for: INST490, INST491, or SDSI492.

INST491 Integrated Capstone for Technology and Information Design (3 Credits)
The capstone provides an opportunity for Technology and Information Design students to integrate and apply the knowledge and skills gained throughout the program. Students will work to address a real-world problem through the design and development of a technology-based solution.
Prerequisite: Minimum grade of C- in INST204, INST367, INST380, INST406, INST454, and INST466.
Jointly offered with: INST490, SDSI492.
Restriction: Must be in the Technology and Information Design program; and must have earned a minimum of 90 credits; and permission of INFO-College of Information Studies.
Credit Only Granted for: INST490, INST491, or SDSI492.

INST600 Foundations for Librarians and Information Professionals (3 Credits)
An introduction to the field of library and information science (LIS), its history, and future direction that provides students with an understanding and appreciation of the nature and functions of the profession(s) they have entered. The focus is on core concepts underlying the LIS discipline, with particular emphasis on professional ethics/values, diversity, equity, inclusion and accessibility (DEIA), and the ways in which technology has shaped and continues to shape the field.
Restriction: Must be enrolled in a graduate program in INFO; or permission of instructor.
Credit Only Granted for: LBSC791 or INST600.
Formerly: LBSC791.

INST604 Introduction to Archives and Digital Curation (3 Credits)
Overview of the principles, practices, and applications in the archival and digital curation fields.
Restriction: Must be enrolled in a graduate program in INFO; or permission of instructor.

INST607 Government Information (3 Credits)
An introduction to the nature and scope of government information (federal, state, and local). Tracing the ongoing efforts of government agencies to offer information, services, and resources online, this course also examines the nature and current impact of new technologies on participatory democracy. More specifically, the course explores information and communication technologies designed to make government more open and transparent; the design, implementation, and evaluation of new government and governance mechanisms, including through the use of social media and AI; the role of legal authorities and information institutions such as libraries in supporting access to government information; and the development and implementation of selected public facing online tools (e.g., data visualization, crowd-sourcing, etc.).
Restriction: Must be enrolled in a graduate program in INFO; or permission of instructor.

INST608 Special Topics in Information Studies (1-3 Credits)
Covers special topics in information studies.
Repeatable to: 6 credits if content differs.

INST610 Information Ethics (3 Credits)
Investigation of the diverse range of ethical challenges facing society in the information age. Ethical theories, including non-Western and feminist theories. Application of theories to information ethics issues.
Restriction: Must be enrolled in a graduate program in INFO; or permission of instructor.

INST611 Privacy and Security in a Networked World (3 Credits)
Evolving conceptualization of privacy and security issues in light of technological developments in the 21st century. Analysis of legal, ethical, design, and socially constructed challenges that organizations and individuals face when developing privacy and security solutions.
Restriction: Must be enrolled in a graduate program in INFO; or permission of instructor.

INST612 Information Policy (3 Credits)
Nature, structure, development and application of information policy. Interactions of social objectives, stakeholders, technology and other forces that shape policy decisions.
Restriction: Must be enrolled in a graduate program in INFO; or permission of instructor.

INST613 Information and Human Rights (3 Credits)
An examination of information as a human right, including topics: social, cultural, economic, legal, and political forces shaping information rights; the impact of information rights on information professions, standards, and cultural institutions; and information rights and disadvantaged populations.
Restriction: Must be enrolled in a graduate program in INFO; or permission of instructor.

INST614 Literacy and Inclusion (3 Credits)
The educational and psychological dimensions of helping and supporting new users to become information literate and experienced users to remain engaged.
Restriction: Must be enrolled in a graduate program in INFO; or permission of instructor.

INST615 Information Professionals and the Law (3 Credits)
An exploration of the interrelated issues of the provision of and information literacy about legal information by information organizations and the impacts of legal issues, such as privacy and filtering, on the practice of information organizations that serve the public.
Restriction: Must be enrolled in a graduate program in INFO; or permission of instructor.

INST616 Open Source Intelligence (3 Credits)
An introduction to Open Source Intelligence (OSINT) for Information Professionals. For the purposes of this course, OSINT is defined as the use of free, publicly available online sources to gather information about people, organizations/groups, places, businesses, activities/events, and capabilities. Collected information is used to conduct analysis or reach conclusions with estimated level of certainty. Students will learn basic and advanced techniques for using search engines, people directories, social networks, location-based services, images and videos, public records, domain analytics, documents, archives, and other sources. Throughout the modules, data quality and validation procedures will be key topics. Professional applications of the skills taught are extensive and include libraries, law offices, journalism, human resources, competitive intelligence, law enforcement, opposition research, government agencies, ethical hacking, and many more.
Restriction: Must be enrolled in a graduate program in INFO; or permission of instructor.

INST617 Computational Journalism (3 Credits)
Designed to teach the application of computational methods in journalism and reporting. The methods include natural language processing, visualization, and web data mining. The course will also cover the necessity and impact of journalistic ethics in designing computation solutions.
Prerequisite: Permission of the Philip Merrill College of Journalism.
Cross-listed with: JOUR773.
Jointly offered with: JOUR473.
Credit Only Granted for: JOUR779V, JOUR773, JOUR473, JOUR479V, INST617, INST408I, or INST403.
Formerly: JOUR779V.

INST620 Diverse Populations, Inclusion, and Information (3 Credits)
Importance of equality of information access. Social, political, and technological barriers to information. Information needs of diverse and underrepresented populations. Principles of inclusive information services.
Restriction: Must be enrolled in a graduate program in INFO; or permission of instructor.

INST622 Information and Universal Usability (3 Credits)
Information services and technologies to provide equal experiences and outcomes to all users. Laws, standards, approaches, component concepts, access needs, and technologies in relation to physical and online information environments.
Restriction: Must be enrolled in a graduate program in INFO; or permission of instructor.

INST623 AI Adoption Clinic: Values-Centered AI for Community Organizations (3 Credits)
The AI Clinic will take on "AI cases" led by the instructor and a group of students with diverse backgrounds, both disciplinary and educational. AI cases will provide students with semester-long, hands-on learning opportunities and prepare them for the challenges of deploying AI in real-world settings.
Jointly offered with: INST423.
Credit Only Granted for: INST423 or INST623.

INST624 Modern Techniques for Software Development (3 Credits)
The ability to create useful, practical software to solve problems is a crucial tool in the information professional's toolbox. At the same time, while many fundamental concepts remain constant, workflows and capabilities change over time in a shifting landscape of tools, platforms, and frameworks. The overall goal of this course is to provide students with a foundation of concepts as well as training in a set of specific tools, to empower them to continue to write useful, trustworthy software. Students will develop competencies to prepare them for advanced courses in data science, analytics, and/or cybersecurity.

INST626 CSS/HTML Basics (3 Credits)
Learn the introductory steps of building a static website using HTML and CSS. The course will introduce students to web architecture such as client-server architecture and the three tier model. The course will also briefly cover the topics of web protocol such as HTTP,HTTPS, FTP.
Restriction: Must be enrolled in a graduate program in INFO; or permission of instructor.
Credit Only Granted for: INST728J or INST626.
Formerly: INST728J.

INST627 Foundations of Data Science (3 Credits)
An overview of data science, with a focus on the application of inferential statistics to structured datasets. These methods help transform raw data into usable information. Topics include: data processing, descriptive statistics, statistical tests, and multiple regression.
Restriction: Must be enrolled in a graduate program in INFO; or permission of instructor.
Additional Information: This course is structured around R as the main software package.

INST630 Programming Human-Centered Interfaces (3 Credits)
An introduction to the development and programming of user interfaces intended for students interested in human-computer interaction. Topics include fundamentals of programming, history and current trends in user interface implementation that are relevant to information professionals.
Restriction: Must be enrolled in a graduate program in INFO; or permission of instructor.

INST632 Human-Computer Interaction Design Methods (3 Credits)
Methods of user-centered design, including task analysis, low-tech prototyping, user interviews, usability testing, participatory design, and focus groups.
Prerequisite: LBSC671, INFM603, or INST631; or permission of instructor.
Restriction: Permission of INFO-College of Information Studies.

INST633 Analyzing Social Networks and Social Media (3 Credits)
Introduces students to the science and social science of network analysis. Through real world examples, including analysis of their own social networks, students will develop skills for describing and understanding the patterns and usage of services like Facebook, Twitter, YouTube, and others. Students will read classic and cutting edge articles and books about these topics and discuss their applicability to this new social media. The class will culminate with a capstone project in which students will apply the analysis methods they have learned to understanding a particular question about social networks and social media.
Restriction: Must be enrolled in a graduate program in INFO; or permission of instructor.

INST638 HCI Professional Preparation Seminar (1 Credit)
The human-computer interaction area is huge and diverse, yet all HCI professionals will face a common set of challenges upon embarking into their future careers, including job hunting, interviewing, joining a team, managing group dynamics, and staying abreast of current technology. Students will learn how to tackle these challenges from a series of speakers familiar with current industry practice.
Repeatable to: 3 credits if content differs.

INST639 Special Topics in HCI (1-3 Credits)
Current industry practice in the HCI and UX field involves being familiar with many practical skills and specialized software. In this repeatable course, HCIM students will be able to acquire some of these vital practical skills in order to be better prepared for joining industry upon graduation. Furthermore, this will also be an opportunity for students to develop their portfolio for future job hunts. Offered in both Fall and Spring semesters, the intention is for these "practical skills" to be taught by professional instructors with expert knowledge. The content of the course will vary from semester to semester, but here is a sample of topics: Graphic and visual design and communication; UX design and research in games; Voice and gestures; UX mockups and wireframing tools; Practical web design and technologies; UX project management software.
Repeatable to: 9 credits if content differs.

INST640 Principles of Digital Curation (3 Credits)
Principles for the design and implementation of long-term curation of digital data and information assets, including born-digital and digitized assets. Frameworks for analysis of technical, practical, economic, legal, social and political factors affecting digital curation decisions. Case studies of specific digital curation scenarios.
Restriction: Must be enrolled in a graduate program in INFO; or permission of instructor.

INST641 Policy and Ethics in Digital Curation (3 Credits)
Discussion of strategies to address intellectual property, privacy, security and other policy and ethics concerns raised by the curation of digital records and data.
Prerequisite: INST604; or INST640; or permission of instructor.
Restriction: Permission of INFO-College of Information Studies.

INST643 Curation in Cultural Institutions (3 Credits)
An overview of the principles, practices, and current debates in the management, care and representation of digital artifacts in libraries, archives, and museums.
Restriction: Must be enrolled in a graduate program in INFO; or permission of instructor.

INST644 Introduction to Digital Humanities (3 Credits)
A survey of the history, methods, and principal topics of the Digital Humanities, examined from theoretical and applied perspectives.
Restriction: Must be enrolled in a graduate program in INFO; or permission of instructor.

INST646 Principles of Records and Information Management (3 Credits)
Principles and practices of managing records in the context of information management programs in government, corporate and other institutional settings. Includes access; legal requirements; digital technologies; and creation, administration, appraisal, and retention and disposition of records.
Restriction: Must be enrolled in a graduate program in INFO; or permission of instructor.

INST647 Management of Electronic Records & Information (3 Credits)
Focuses on the life cycle of records and the impact of technology programs for managing electronic records. Explores the roles of records managers in the management of electronic records.
Restriction: Must be enrolled in a graduate program in INFO; or permission of instructor.

INST650 Facilitating Youth Learning in Formal and Informal Environments (3 Credits)
The historical, organizational, and contemporary contexts of formal and informal learning spaces; the principles of teaching, learning, and information literacy that underlie the formal and informal learning spaces; and the leadership role that information professionals can play within their schools, libraries and communities.
Restriction: Must be enrolled in a graduate program in INFO; or permission of instructor.

INST651 Promoting Rich Learning with Technology (3 Credits)
Exploration of how technology can be used to promote rich learning experiences, with a particular focus on youth populations. Assessment of the how, when, and why of infusing technology into the teaching and learning process.
Restriction: Must be enrolled in a graduate program in INFO; or permission of instructor.

INST652 Design Thinking and Youth (3 Credits)
Methods of design thinking specifically within and for youth contexts, including user-centered design, understanding user needs, ideation, contextual design, participatory design, iterative prototyping, and visual design. These topics will specifically be studied in the context of designing with and for youth.
Restriction: Must be enrolled in a graduate program in INFO; or permission of instructor.

INST653 Introduction to Museum Scholarship (3 Credits)
Provides students a basic understanding of museums as cultural and intellectual institutions. Topics include the historical development of museums, museums as resources for scholarly study, and the museum exhibition as medium for presentation of scholarship.
Cross-listed with: AMST655, ANTH655, HIST610.
Credit Only Granted for: AMST655, ANTH655, HIST610, INST728T or INST653.

INST654 UX Business Basics (3 Credits)
To be effective in their roles, UX practitioners must also be effective in the corporate world. That means working jointly and effectively with engineering, product management, management, and clients. The role and expectations of UX practitioners however vary significantly from business unit to unit, team to team. This course focuses on three main areas that will affect your UX influence in the corporate world including methods for establishing research and design processes, effectively implementing UX strategy in the business environment, and curating your personal and professional readiness as a UX practitioner. This course will introduce you to decentralized design and how to not only advocate for user-centered design but also empower other internal teams to make user-centered, data-driven design decisions.

INST660 Strategic Leadership (3 Credits)
Students will use research and best practices to act and think like a leader, increase your self-awareness, and learn how to unlock potential in others. From the stories of great leaders and everyday people, you will learn and practice empowerment, accountability, courage, creativity, and humility, which are the key leadership skills. In addition, this course will teach you how to create new opportunities and lasting impact to drive growth and value creation in your organization.
Prerequisite: INFM612; or LBSC631; or LBSC635; or permission of instructor.
Restriction: Permission of INFO-College of Information Studies.
Credit Only Granted for: INST660, LBSC708F or INFM718F.
Formerly: LBSC708F, INFM718F.

INST661 Introduction to Game, Entertainment, and Media Analytics (3 Credits)
With the continuing global growth in the Game, Entertainment, and virtual/augmented reality and immersive experiences industries, entertainment providers increasingly depend on data analytics to maintain a competitive edge while continuing to improve the customer experience. This course provides an overview of the Game, Entertainment, and Media (GEM) industries, discuss the relationships between the entertainment providers and the entertainment consumers, and explore the analytical techniques used to maximize the overall value to both the providers and consumers. The course will focus on the uses of analytics methods such as personalization, recommendation, clustering and segmentation, behavioral analytics, etc., will discuss core data management and data architecture concerns, and examine how big data infrastructure can support scalability as data volumes grow and as streaming speeds accelerate. In addition we review socio-technical aspects of entertainment, especially in the areas of cyberpsychology, social networks, and information policy concerns such as privacy protection, fraud, equity, and national security concerns.
Prerequisite: Permission of the instructor.

INST662 Networked Infrastructure (3 Credits)
An introduction to the devices (especially personal computing devices, switches, routers, servers, and controllers) and protocols (TCP/IP) that form the internet. Through hands-on lab and simulation work, students will build and configure scalable computer networks, embedding secure design principles at every stage. Each week students will be given access to hardware, software, and cloud tools to build illustrative small models of larger networks. A core feature of the course is its integration with "Cyber Defense and Ethical Hacking." Students will not only construct network infrastructures but also see them tested and attacked by peers in the companion course, gaining valuable feedback and insights on the effectiveness of their designs under real-world threat conditions. By the end of this course, students will be equipped to design, defend, and iterate on infrastructure in adversarial conditions, gaining a deep understanding of the technical and human dimensions of cybersecurity.
Restriction: Must be a graduate student in the INFO college.

INST663 Cyberdefense and Ethical Hacking (3 Credits)
Learn to assess and defend real-world information systems through applied cybersecurity techniques and adversarial thinking. Working in tandem with the "Networked Infrastructure" class, students in this course take on the role of ethical hackers, probing and penetrating the networks built by their peers. This iterative cycle fosters a high-feedback learning environment where both attackers and defenders refine their skills in tandem. Focusing on threat detection, mitigation strategies, and incident response, students will use industry-standard tools and AI-augmented systems to simulate modern cyberattacks. They will also explore how to design systems that are resilient to these threats, studying historical case studies and performing red-team/blue-team exercises.
Restriction: Must be a graduate student in the INFO college.

INST664 Transforming Unstructured Content with AI (3 Credits)
Automated generation of structured data from unstructured information sources such as text, images, audio, and video. Transformations include text representation, classification, topic and entity extraction, as well as captioning, transcription, and event description for other modalities. The course covers classical feature-based approaches and modern generative AI, especially large language models, with an emphasis on evaluation, limitations, and ethical considerations.
Restriction: Must be a graduate student in the INFO college.

INST670 Introduction to Javascript Programming (1 Credit)
Introduction to the fundamentals of Javascript programming. Basic components of all programming languages, including variables, types, data structures, and control flow, with a focus on leveraging Javascript libraries for more advanced functionality. No prior experience needed.

INST671 Introduction to Web Programming (1 Credit)
Introduction to the fundamentals of designing and programming web sites. HTML programming extended by work with Cascading Style Sheets. Programming skills are complemented with fundamentals of design and usability. No prior programming experience needed.
Credit Only Granted for: INST728W or INST671.
Formerly: INST728W.

INST673 Hands On Machine Learning with Weka (1 Credit)
Students will receive hands on experience with the open-source machine learning tool Weka. Topics covered will be classification, regression, basic algorithm types, how to get data into a format Weka can process, how to interpret results, and basic document classification. The class will meet online.
Recommended: It is recommended that students have some familiarity with programming prior to taking this course.
Restriction: Must be enrolled in a graduate program in INFO; or permission of instructor.

INST680 Health Informatics (3 Credits)
An introduction to the ways in which medical data, information, and knowledge are created, stored and used. Students will gain an understanding of the current trends in the delivery of medical care and the ways in which these trends influence health information resources and systems.
Prerequisite: Must have completed or be concurrently enrolled in INFM600 or LBSC602; or permission of instructor.
Restriction: Permission of INFO-College of Information Studies.

INST681 Health Information Behavior (3 Credits)
Exploration of information needs of healthcare professionals and the general public, as well as how they seek information to fulfill these information needs, impacts and outcomes of health-related information-seeking by multiple populations. Examination of models and theories and empirical studies of patient and healthcare professional information behavior.
Prerequisite: INFM600; or LBSC602; or permission of instructor.
Restriction: Permission of INFO-College of Information Studies.

INST682 Personal Health Informatics & Visualization (3 Credits)
Personal Health Informatics cover a broad concept that encompasses an array of approaches to collect, store, share, analyze, and reflect on personal health data. Not only health care providers are relying on Health Technologies to improve patient care, people are increasingly using health devices and apps in their everyday life. Individuals have started using new technologies to collect data, increase awareness, and reflect on and change their behaviors. They also use various tools for curiosity and fun. This course will provide an overview of this exciting field and examine how social and behavioral theories can be applied to create effective health applications.It is difficult to create health technologies that can successfully be integrated into people's daily life due to many obstacles in individuals' data collection, integration, self-reflection, and sharing practices. Understanding these challenges is an important part of designing Health Technologies. Therefore, this course will cover HCI and design thinking methods that you can leverage in understanding the adoption of Health Technologies. Moreover, visualizations facilitate people to gain insights from their data, so we will cover common visualization approaches used in the personal data contexts.

INST700 Information Architecture (3 Credits)
An introduction to the fundamentals of information architecture and how it's used in the design of digital products and services and in cross-channel service design.
Credit Only Granted for: INST639L or INST700.
Formerly: INST639L.

INST701 Introduction to Research Methods (3 Credits)
Techniques and strategies of research as applied to the definition, investigation, and evaluation of information problems. Qualitative, quantitative, and mixed methods of research design methods are considered from the aspects of implementation, analysis, and interpretation.
Restriction: Permission of INFO-College of Information Studies.
Credit Only Granted for: LBSC701, INFM718M or INST701.
Formerly: LBSC701, INFM718M.

INST702 Advanced Usability Testing (3 Credits)
Usability test design, implementation and analysis for computer and mobile devices; special attention will be paid to remote testing. Students will learn the complex process of coordinating and facilitating a usability test and how to synthesize test data into reports appropriate for various audiences.
Prerequisite: Permission of instructor; or (INFM605 or INST631).
Restriction: Permission of INFO-College of Information Studies.

INST703 Visual Design Studio (3 Credits)
This hands-on studio course will help students develop foundational visual skills related to user experience (UX) design. Students will explore methodologies and processes used in many of the industry's top creative environments and study the entire visual design skillset, including concept development, content creation, system design, and tools and process.
Restriction: Must be in the Human-Computer Interaction Master's program.

INST704 Inclusive Design in HCI (3 Credits)
An introduction to inclusive technology design, that is, the design and evaluation of user interfaces for diverse users and use contexts. Building on basic concepts in human-computer interaction, students will learn about design exclusion and barriers to use, and methods by which these can be overcome. Assistive input and output technologies will also be covered. Populations include older adults, users with visual, cognitive or motor impairments, users who are deaf or hard of hearing, children, users in low resource contexts, and users in mobile contexts. Research trends and practical design considerations (e.g., web accessibility requirements) will be covered. Students will interact with the material through readings, discussion, and individual and group assignments.
Prerequisite: INST631.
Restriction: Must be enrolled in a graduate program in INFO; or permission of instructor.

INST705 Game Design Studio (3 Credits)
Learn the fundamentals of game design by applying elements and principles of game design, such as goals, rules, and challenges, to create board games, card games, and digital games. Students will be introduced to the basic tools and methods of game design: paper and digital prototyping, design iteration, design critique, and user testing. Students will design several games of different types to add to a growing portfolio of game design concepts. Students will also learn how to use their skills to deconstruct and critique the components of existing games, as well as gain an understanding of the role of the game designer in real-world game development teams.
Recommended: Programming experience will be useful, but not strictly necessary.
Credit Only Granted for: INST705, INST728E, or INST408J.

INST706 Project Management (3 Credits)
Comprehensive overview of project management, focusing on the needs of information resource (IR) projects. Concepts and techniques for planning and execution of projects including developing work breakdown structure, estimating costs, managing risks, scheduling, staff and resource allocation, team building, communication, monitoring, control, and other aspects of successful project completion.
Prerequisite: INFM603 and INFM612; or (LBSC631 and LBSC671); or (LBSC635 and LBSC670); or permission of instructor.
Restriction: Permission of INFO-College of Information Studies.
Credit Only Granted for: INST706 or INFM706.
Formerly: INFM706.

INST709 Independent Study (1-3 Credits)
Intensive individual study, reading, or research in an area of specialized interest under faculty supervision. Registration limited to the advanced student with the approval of the advisor and of the faculty member involved.
Prerequisite: Completion of all core courses.
Restriction: Permission of INFO-College of Information Studies; and permission of instructor.
Repeatable to: 9 credits.
Additional Information: A student may complete no more than 9 credits registered under 709 or a total of 12 credits registered under 708 and 709.

INST710 User Experience Research Methods (3 Credits)
Students will learn to conduct user research in industry and to provide foundational knowledge needed for academic research. It examines the theoretical and epistemological differences between research paradigms and provides an overview of qualitative, quantitative and mixed-method approaches. It overviews user-centered design (UCD) methods, and uses Contextual Inquiry/Contextual Design as the backbone for a research project, incorporating related formative UCD methods and techniques. It is a project-based course, where students conduct a semester-long project to prepare them for the HCIM Capstone as well as other types of formative user research.

INST711 Interaction Design Studio (3 Credits)
Covers basic interaction design principles and design process from a studio-based design perspective. Focuses on how to design for interactions that will resonate with your audiences: how the features and functions of a project get translated into something people find usable, useful, and desirable. Explores the role of interaction designers. Students design and prototype interactive products, systems, and services.
Additional Information: Enrollment is prioritized for HCIM students. Remaining seats may be filled with permission from the INFO program or the instructor.

INST713 Futures of Work (3 Credits)
Are robots taking our jobs? Are there any jobs even worth taking? What other futures of work might we build? This course examines these questions by focusing on the labor process of computer-supported collaborative work (CSCW) in domains ranging from transportation to software development to sex work, drawing on research and theory from sociology, organizational studies, HCI, and more. Design-oriented students will be encouraged to develop interventions to enhance not just productivity but autonomy and democracy. Research-oriented students will learn to study workplaces and situate shopfloor developments in global political economy.
Credit Only Granted for: INST713 or INST728Y.
Formerly: INST728Y.

INST717 Internship Practicum in Human-Computer Interactions (3 Credits)
Required, supervised experience working in an industry, government, non-profit organization or an educational institution to address a problem in Human-Computer Interaction. Students will spend a minimum of 120 hours working in the agency during the internship.
Prerequisite: INST631 and INST632.
Recommended: INST701.
Restriction: Permission of INFO-College of Information Studies; and must be in Human-Computer Interaction (Master's) program.

INST725 Legal Research for Information Professionals (3 Credits)
An in-depth exploration the methods, resources, and context of conducting advanced legal research. After offering an overview of various types of legal materials, the course will focus on finding and analyzing legal materials through various primary sources, databases, secondary sources, and public records for government and corporate settings. The course will also discuss practical issues of conducting legal research, such as data management and budgeting.
Prerequisite: INST615.
Restriction: Must be enrolled in a graduate program in INFO; or permission of instructor.

INST726 Information Governance (3 Credits)
Offers a comprehensive introduction to information governance, an emerging discipline concerned with how organizations minimize risk and maximize the value associated with their information assets. Drawing from real-life examples from the private and public sectors, the course will explore important facets of information governance, including how institutions incorporate best practices in records and information management, data storage and archiving, e-discovery, privacy, cybersecurity, analytics, risk management, and compliance. The course will also provide practical lessons in developing a state-of-the-art information governance program.

INST727 Information Institutions Roles and Responses during Crises (3 Credits)
By embracing a preparation lens, examine the roles and responses that information institutions can play before, during, and after crises (defined broadly). Engage in the processes of design, execution, reflection, iteration, and evaluation of the agile and dynamic structures needed to respond to crises. Acquire the knowledge, skills, and mindsets necessary to serve communities in times of crisis. Given that new crises are constantly emerging, this course will weave in tried-and-true examples of essential tasks that need to be executed before, during, and after crises; reflective exercises to measure readiness and gauge the effectiveness of approaches; assessments to evaluate the achievement of intended outcomes; and guidance for information institution staff and administrators that emphasizes comfort with ambivalence, uncertainty, and imperfection.
Credit Only Granted for: LBSC708X or INST727.
Formerly: LBSC708X.

INST728 Special Topics in Information Studies (1-3 Credits)
Selected topics in information studies.
Restriction: Permission of INFO-College of Information Studies.
Repeatable to: 9 credits if content differs.

INST729 International Opportunities in Information Studies (3 Credits)
Short term, experiential course offered in conjuction with the University's Study Abroad Office, to volunteer, complete a project, or conduct research in a library or information organization outside the U.S. Focus and location varies.
Restriction: Must be enrolled in a graduate program in INFO; or permission of instructor.

INST730 Games as Emergent Experiences (3 Credits)
Videogames are designed objects that players bring their own history to, resulting each time in a unique emergent experience. If you've ever wondered why you love a certain game but others hate it, why you prefer one genre of game over another, or why the frustration you feel in complicated games is often actually enjoyable, this is the class for you! We will examine design principles instantiated in various games, analyze how failure and feedback support productive gameplay, discuss how mechanics and aesthetics contribute to emergent experiences, and develop an understanding of the field of games scholarship.
Credit Only Granted for: INST608K, INST408K or INST730.
Formerly: INST608K.

INST731 Advanced Game, Entertainment, and Media Analytics (3 Credits)
Analytical techniques and research methods are on the rise in gaming, entertainment, and media (GEM) industries. Students will expand their critical thinking skills, explore the current state of GEM analytics, summarize data creatively, improve data-driven decision making, and optimize reporting in real-world situations. This course will assist students in applying and developing advanced analytical skills specifically designed for gaming, entertainment, and media analytics in their individual areas of interest. Students will achieve this through the development of critical thinking skills as well as advanced demonstration of skills and knowledge in various data science techniques and analytical methods, such as modeling, database management, information workflow analysis, usability research, statistical analysis, predictive analytics, natural language processing (NLP), data mining, and machine learning techniques.
Prerequisite: INST661.
Credit Only Granted for: INST728Z or INST731.
Formerly: INST728Z.

INST732 Entertainment Theory (3 Credits)
An entertainment environment is a setting in which audiences interact with content developed to please, charm, cheer, interest, engage, and enthrall distinct individuals and groups. Entertainment environments surround us in all parts of our lives-this course aims to dissect them using a foundation of entertainment theory, including a set of models and theories examining motivations for entertainment consumption; selection of content; processing of content; evaluation of content; and cognitive, attitudinal, and behavioral effects of content.

INST733 Database Design (3 Credits)
Principles of user-oriented database design. Requirements analysis. Data modelling. Data integrity and security and multi-user databases. Implementing an information system using a database management system (DBMS).
Prerequisite: LBSC690, LBSC671, or INFM603; or permission of instructor.
Restriction: Permission of INFO-College of Information Studies.
Credit Only Granted for: INST733 or LBSC793.
Formerly: LBSC793.

INST734 Information Retrieval Systems (3 Credits)
Principles of organizing and providing access to information using automated information storage and retrieval systems. Retrieval systems models, index language selection, data structure, user interfaces, and evaluation for text and multimedia applications.
Prerequisite: LBSC671 or INFM603; or permission of instructor.
Restriction: Permission of INFO-College of Information Studies.
Credit Only Granted for: INST734 or LBSC796.
Formerly: LBSC796.

INST735 Natural Language Processing (3 Credits)
Introduce fundamental concepts, techniques, and algorithms for the computational handling of natural language. Statistical and machine learning techniques, models, and algorithms that enable computers to deal with the ambiguity and implicit structure of human language. Approaches that focus on uncovering linguistic structure, such as syntactic or semantic parsing, as well as those that focus on manipulating text in useful ways, such as question answering or machine translation.
Prerequisite: Minimum grade of C- in CMSC422; and permission of CMNS-Computer Science department.
Cross-listed with: CMSC723, LING723.
Credit Only Granted for: CMSC723, LING723, or INST735.
Additional Information: CMSC students may only receive PhD Comp. credit for CMSC723 or CMSC823, not both.

INST736 Computational Linguistics II (3 Credits)
Natural language processing with a focus on corpus-based statistical techniques. Topics include: stochastic language modeling, smoothing, noisy channel models, probabilistic grammars and parsing; lexical acquisition, similarity-based methods, word sense disambiguation, statistical methods in NLP applications; system evaluation.
Prerequisite: LING723, CMSC723, or INST735; or permission of instructor.
Cross-listed with CMSC773, LING773.
Credit Only Granted for: CMSC773, LING773, or INST736.
Additional Information: CMSC students may only receive PhD Comp. credit for CMSC723 or CMSC823, not both.

INST737 Data Science Techniques (3 Credits)
Computers have made it possible, even easy, to collect vast amounts of data from a wide variety of sources. It is not always clear, however, how to use those data and how to extract useful information from them. This problem is faced in a tremendous range of scholarly, government, business, medical, and scientific applications. This course will provide students with an overview of the different components of the Data Science pipeline and with practical skills to implement it. Data Science is by nature an applied science. This course will use real datasets from open data sources and data challenges from a variety of disciplines to immerse students in real Data Science settings and to teach them about the challenges that arise when working with complex, imperfect data.
Prerequisite: INST627; and (LBSC690, LBSC671, or INFM603). Or permission of instructor.
Restriction: Permission of INFO-College of Information Studies.

INST741 Social Computing Technologies and Applications (3 Credits)
Tools and techniques for developing and configuring social computing applications. Theories and paradigms for social computing. Strengths and limitations of different application styles and types. Evolution of applications as responses to social computing challenges. Information and organizational systems co-development.
Prerequisite: INFM603 and INFM605; or (LBSC602 and LBSC671); or permission of instructor.
Restriction: Permission of INFO-College of Information Studies.
Credit Only Granted for: INFM741 or INST741.
Formerly: INFM741.

INST742 Implementing Digital Curation (3 Credits)
Hands-on learning experiences with real-world environments and examples that touch on significant areas of digital curation. Selected topics will be chosen to allow students to find and explore best current practices in the use of representative tools. There will be assigned readings each week with opportunities to experiment with software environments and manage data and records. Due to the rapidly evolving nature of the field, the tools and topics will reflect current trends.
Prerequisite: INST604; or permission of instructor.
Restriction: Permission of INFO-College of Information Studies.

INST744 Solving Problems in Digital Curation - Capstone Course (3 Credits)
Project-based course that applies digital curation principles and techniques first-hand in an institutional program setting. The focus is on a well-defined project that constitutes a learning experience and also permits the student to contribute to the ongoing work of the host institution. The project must address one or more aspects of digital curation: design and implementation for long-term digital curation of a discrete collection; application of technologies and standards for digitization, description, and preservation of digital assets; or implementation of strategies to provide access to a digital collection.
Restriction: Must be enrolled in the Curation and Management of Digital Assets (CMDA) Certificate.

INST747 Research in Advanced Digital Curation (3 Credits)
Students will build their ability to understand the complexity of research strategies and apply tools involved in the management and use of digital information in the Age of Big Data. The class will contain class lectures, class discussions, assigned readings, and extensive hands-on experience with student experience in digital curation projects. The research projects are focused around six major themes that will engage students in multiple arenas of research in Big Data. These are: community displacement, refugee narratives, movement of people, citizen internment, racial zoning, and cyberinfrastructure for digital curation. Project participants will have the opportunity to work with external stakeholders.
Prerequisite: INST604; or permission of instructor.
Restriction: Permission of INFO-College of Information Studies.

INST750 Advanced Data Science (3 Credits)
Application of data science techniques to unstructured, real-world datasets including social media and geo-referenced sources. Techniques and approaches to extract information relevant for experts and non-experts in areas that include smart cities, public health, and disaster management.
Prerequisite: INFM603 and INST737; or permission of instructor.
Restriction: Permission of INFO-College of Information Studies.
Credit Only Granted for: INFM750 OR INST750.
Formerly: INFM750.

INST751 IoT and Streaming Data Analytics (3 Credits)
An increasing number of sensors, actuators, Internet-connect instruments and apparatuses, smart devices, and systems are generating and broadcasting a wide variety of continuous data streams. Machine-generated structured data sources are joined by a myriad of unstructured data streams from social media, weather, and news sources, among others. Integrated into networks, these continuously-streaming devices (collectively referred to as the Internet of Things, or IoT) provide a fertile array of data sources that can be ingested and analyzed to inform and automate decision processes for numerous purposes including operational intelligence, process monitoring, optimization, risk management, personalization, and prediction in real time. This course looks at architectures and operational modes for streaming data sources and examine methods for descriptive analytics, creation of predictive models, and integrated deployment of these models via centralized and edge computing resources. We will discuss a variety of uses cases for streaming data analytics and how they are applied in different industries including public utilities, smart cities, manufacturing, telecommunications, and healthcare.
Prerequisite: INFM603, INST733, or other programming and database courses, or Permission of the instructor.

INST752 Location Intelligence (3 Credits)
Provides a comprehensive overview of the principles of geographic information systems and location analytics for a variety of business scenarios. Explores the processes for integrating location information, maps, and demographic information with business information and implementing analytical applications. Reviews business contexts such as government and citizen analysis, zoning and planning, retail site selection, supply chain management and logistics, fieldservice planning and tracking, real estate, insurance, public safety, municipal maintenance, and others. Provides hands-on opportunities to apply location intelligence methods.
Prerequisite: INFM600, INFM603, INST630, and INST733; or permission of INFO-College of Information Studies.

INST753 Data Governance and Data Quality (3 Credits)
Surveys the methods and practices for understanding the relationship between organizational performance objectives and their effective oversight, use, and management of information. Examines methods for instituting information governance, data governance, and data quality in the context of information policies for assessing information risk, observing data policies, and enforcing accountability for protection of sensitive information. Explores models of data ownership and accountability, roles and responsibilities for data governance and data stewardship, and processes for soliciting and documenting information and data requirements. Covers techniques for data quality assessment, specification of data quality rules, and applications for validating compliance with data quality expectations, monitoring levels of data quality, and notifications and dashboards for monitoring data compliance.
Prerequisite: INFM600, INFM603, and INST733; or permission of INFO-College of Information Studies.

INST754 Data Integration and Preparation for Analytics & Visualization (3 Credits)
Provides a comprehensive overview of the end-to-end processes for acquiring, ingesting, managing, cleansing, transforming, and integrating data sources for the purposes of reporting, analytics, and visualization. Concepts include data acquisition, data streaming, data staging, standardization, Data Profiling, data cleansing, data quality, concept and metadata harmonization, transformation, data warehousing, data governance, data modeling, and data visualization. Students will learn how ingested data sets can be transformed, integrated, and prepared for analytical use with dashboards and visualization.
Prerequisite: INFM600, INST630, and INST733; and (INFM603 or JOUR652) ; or permission of INFO-College of Information Studies.

INST755 eGovernment for Smart Cities (3 Credits)
Federal, state, and local government entities are increasingly communicating, interacting, and providing services digitally in an online and networked environment. Concurrently, urban planners and administrators seek to leverage the potential of rapidly evolving technologies to transform service provisioning for the efficient management of assets and resources, with the goal of creating sustainable, livable, innovative, and economically vibrant cities and communities. This course will examine the intersection of these two developments and provide a framework for understanding the technical, policy, and information management issues that are emerging.

INST756 Information Risk Management (3 Credits)
Looks at information system threats, vulnerabilities, risk assessment and management. Explores how regulations scope and define what is considered to be protected information. Considers how data assets are assessed and classified in terms of their levels of sensitivity. Discusses specifying data protection policies and the techniques for enforcing compliance with those policies.
Prerequisite: INFM600; or permission of INFO-College of Information Studies.

INST760 Data Visualization (3 Credits)
Introduction to the science and technology of data visualization--the graphical representation of data to aid understanding--and includes both theoretical foundations as well as practical applications of integrated visualization techniques on real-world problems. Application of these techniques to state-of-the-art problem domains within research, society, and industry.
Prerequisite: INST630; or INFM603; or permission of instructor.
Restriction: Permission of INFO-College of Information Studies.

INST762 Visual Analytics (3 Credits)
Visual analytics is the use of interactive visual interfaces to facilitate analytical reasoning. In essence, visual analytics is based on the--not uncontroversial--idea that humans and computers working alone are insufficient for the data challenges of today and tomorrow, and that effective synthesis of both humans and computational algorithms are needed to create human-in-the-loop systems. Thus, visual analytics bridges human-centered disciplines such as visualization and human-computer interaction with computation-centered disciplines such as machine learning, probabilistic methods, and knowledge discovery. The course contents will include both theoretical foundations of this interdisciplinary science as well as practical applications of integrated visual analysis techniques on real-world problems.
Prerequisite: INFM603, INST630, or JOUR652; or permission of instructor.
Restriction: Permission of INFO-College of Information Studies.

INST764 Data Literacy for Arts and Entertainment Management (3 Credits)
This survey course provides an overview of the integral use of data and information to manage, inform the operations, engage customers, patrons, and donors, and influence product/exhibit/program design in arts and entertainment businesses and organizations. The course will introduce core concepts of data literacy such as metadata and data management for collection curation and management, information seeking behaviors and enabling search, data management for business operations, descriptive analytics for reporting, using data for customer relationship management, and more advanced analytics. The course will explore how all these concepts fit together in the context of Arts and Entertainment Management and provide laboratory projects that provide hands-on experience with the different information and data management practices discussed.
Restriction: Must be enrolled in a graduate program in INFO; or permission of instructor.

INST767 Big Data Infrastructure (3 Credits)
Principles and techniques of data science and business intelligence. Technologies and architectures for large-scale data warehousing and scale-out data analytics platforms. Supervised and unsupervised data mining.
Prerequisite: INST737; or permission of instructor.
Restriction: Permission of INFO-College of Information Studies.

INST770 International Opportunities in Information Studies (3 Credits)
Experiential learning about topics in information studies within global contexts.
Credit Only Granted for: INST370 or INST770.

INST771 Foundations of Cybersecurity (3 Credits)
Explores the foundational concepts of cybersecurity including the Threat Landscape, the evolution and structures of the global telecommunications network, key communication protocols and foundations of networks, the history, culture and emergence of the hacking process, and the core motivations and tactics of threat actors.

INST772 Policy and Practice of Ethical Hacking (3 Credits)
Provides students with an understanding of the ethical frameworks and technical approach in the conduct of penetration testing and ethical hacking. Students will work with real systems in real environments and will leverage real vulnerability analysis and exploitation tools in a live environment. Upon completion, students will understand the overall concepts guiding penetration testing from a practical, hands-on vantage point.
Prerequisite: Must have completed or be concurrently enrolled in INST771.

INST773 Cyber Intelligence Fundamentals (3 Credits)
Provides students with an understanding of how to identify, track, and report on malicious activity. Students will learn to identify and work with malware and network data and pair it with a broader set of threat intelligence information to draw conclusions based on the totality of open source information and network intelligence. Students will gain a in depth understanding of the principles of cyber threat intelligence and techniques applied in the cyber threat industry. Students will engage in in-depth discussion and practice in evaluating and interpreting indicators of compromise, command and control, and artifacts left by malicious actors.
Prerequisite: INST771.

INST775 HCIM CAPSTONE PREP (3 Credits)
Students will define a project, which requires a high level of background research, rigor in execution and evaluation, and documentation. Capstone projects may follow the design, prototyping and evaluation process from end-to-end or may focus on a subset of elements in that process, such as formative study and design.
Prerequisite: INST631, INST632, and INST717; and must have completed Research Methods; and permission of INFO-College of Information Studies. Or permission of instructor.
Restriction: Must be taken in the fall semester of the year in which the student plans to graduate; and permission of INFO-College of Information Studies.

INST776 HCIM CAPSTONE PROJECT (3 Credits)
The opportunity to apply the skills learned through coursework in a semester-long project applied to a real -world problem. Capstone projects may follow the design, prototyping and evaluation process from end-to-end or may focus on a subset of elements in that process, such as formative study and design.
Prerequisite: INST775; or permission of instructor.
Restriction: Must be taken in the semester immediately following completion of INST775 HCIM Capstone Prep; and permission of INFO-College of Information Studies.
Additional Information: Enrollment is prioritized for HCIM students. Remaining seats may be filled with permission from the INFO program or the instructor.

INST779 Readings Seminar (1 Credit)
Readings in emerging topics. Through readings and discussion the class will critically assess future directions and highlight intersection points with other disciplines (e.g., medicine) and sub-disciplines of information studies and computer science (e.g., information retrieval, computer vision, machine learning). One or more themes will be covered over the semester (e.g., inclusive design, health informatics, environmental sustainability, social networking) and will be chosen based on instructor and student interest.
Restriction: Must be enrolled in a graduate program in INFO; or permission of instructor.
Repeatable to: 3 credits if content differs.

INST782 Arrangement, Description, and Access for Archives (3 Credits)
Introduction to the key concepts and practices involved with arrangement and description of archives, and the techniques appropriate to enable users to access archival information in traditional and nontraditional archival contexts.
Prerequisite: INST604; or permission of instructor.
Restriction: Permission of INFO-College of Information Studies.

INST784 Digital Preservation (3 Credits)
Issues and practices regarding digitization of analog materials and preservation of digital materials, both digitized and born digital.
Prerequisite: INST604; or permission of instructor.
Restriction: Permission of INFO-College of Information Studies.

INST785 Documentation, Collection, and Appraisal of Records (3 Credits)
Development of documentation strategies and plans; collecting policies to guide programs in acquiring records; theories and techniques for appraising records to identify those with continuing value.
Prerequisite: INST604; or permission of instructor.
Restriction: Permission of INFO-College of Information Studies.

INST786 Museum Research Seminar (3 Credits)
A research seminar focusing on the practice and presentation of cultural and historical scholarship in museums and historical sites. Students will complete an original research project on the challenges and opportunities of public exhibition and interpretation of cultural and historical research.
Prerequisite: AMST655, ANTH655, or HIST610.
Cross-listed with: AMST856, ANTH856, HIST810.
Credit Only Granted for: AMST856, ANTH856, HIST810, INST728U or INST786.

INST787 Museum Scholarship Practicum (3-6 Credits)
Students devise and carry out a research program using the collections at the Smithsonian Institution or some other cooperating museum, working under joint supervision of a museum professional and a university faculty member.
Prerequisite: AMST856, ANTH856, or HIST810.
Cross-listed with: AMST857, ANTH857, HIST811.
Restriction: Permission of Museum Scholarship Program required.
Credit Only Granted for: AMST857, ANTH857, HIST811, INST728I or INST787.

INST788 Special Topics: Collaborative Curation (3 Credits)
This seminar considers the history of curation and curators within the institutional setting of museums and offers participants the opportunity, and challenge, to engage in curatorial practice by planning an exhibition that focuses on a critical aspect of life at and around the University of Maryland over the years.
Prerequisite: AMST655, ANTH655 or HIST610.
Recommended: AMST856, ANTH856, or HIST810; and AMST857, ANTH857 or HIST811.
Cross-listed with: AMST659, ANTH659, HIST688.
Restriction: Must have permission of the Museum Studies and Material Culture program.
Repeatable to: 6 credits if content differs.
Additional Information: Students enrolled in the MSMC (Museum Studies and Material Culture) certificate program will be given priority for enrollment.

INST789 Non-Thesis Research (1-6 Credits)
Covers non-thesis research in the field of Information Studies
Restriction: Must be in a program within the College of Information (INFO).
Repeatable to: 12 credits.

INST794 Capstone in Youth Experience (3 Credits)
Through a supervised project, to synthesize design thinking, participatory design, connected learning, and learning theory/frameworks students will produce a technology-infused program for and with youth. Students will develop and carry out a project with a community partner through their library system. The project must incorporate technology and design thinking, and must be based on one or more learning theory/frameworks. Through the course, students will learn many practical skills related to planning and implementation of a technology-infused programming at or through their library, including marketing, fundraising, budgeting, legal issues, logistical issues, developing and sustaining community partnerships, developing engaging experiences for youth, and creating and analyzing learning assessments.
Prerequisite: INST650, INST651, and INST652; or permission of instructor.
Restriction: Permission of INFO-College of Information Studies; and must be part of Youth Experience (YX) certificate program.

INST798 Seminar in Research Methods and Data Analysis (3 Credits)
Topics and issues in information studies research. Design and conduct of research project.
Jointly offered with: INST808.
Restriction: Must be enrolled in a graduate program in INFO; or permission of instructor.
Repeatable to: 9 credits if content differs.

INST799 Master's Thesis Research (1-6 Credits)
Repeatable to: 99 credits.

INST800 Pre-Candidacy Proseminar (1 Credit)
An introduction to the academic life within a doctoral program with a focus on practical professional development.
Restriction: Must be in the Ph.D. in Information Studies (INFS) program.

INST801 Theoretical Foundations in Information Studies I (3 Credits)
Pursuing a doctorate in information studies involves the scholarly examination of the interaction between people, information, technology, and society. There are, however, as many ways to examine the interaction of people, information, technology, and society as there are researchers and ways of understanding what counts as evidence and knowledge in different components of the field. In the first of this 2-course sequence (INST801 and INST802), students will be introduced to the diverse scholarly traditions that comprise information studies. Students will explore why there are so many ways of knowing and methods of discovery within the field, in order to help them identify the social theory and methods that will support their path through information scholarship.
Restriction: Restricted to students in the PhD. in Information Studies (INFS) program.
Credit Only Granted for: INST888 or INST801.
Formerly: INST888.

INST802 Theoretical Foundations in Information Studies II (3 Credits)
Pursuing a doctorate in information studies involves the scholarly examination of the interaction between people, information, technology, and society. There are, however, as many ways to examine the interaction of people, information, technology, and society as there are researchers and ways of understanding what counts as evidence and knowledge in different components of the field. In the second of this 2-course sequence (INST801 and INST802), students will be introduced to the diverse scholarly traditions that comprise information studies. Students will explore why there are so many ways of knowing and methods of discovery within the field, in order to help them identify the social theory and methods that will support their path through information scholarship.
Prerequisite: INST801.
Credit Only Granted for: INST888 or INST802.
Formerly: INST888.

INST803 Pragmatic Foundations for Information Studies (3 Credits)
Information Studies' paradigmatic richness places particular burdens on the individual researcher. Framing research agendas, motivating research questions, conducting literature reviews, selecting methods, and even arguing for particular conclusions is complicated by the number of alternative approaches available to the Information Studies scholar. Faced with this complexity, it is tempting to select a single paradigm and "be done with it" - and in doing so forego a primary strength of the interdisciplinary field. The purpose of this seminar is to help you develop the pragmatic skills and techniques needed to navigate the complexity of a multi-paradigm field such as Information Studies, so that you can draw on its paradigmatic richness to develop your research interests into valuable new insights (or at least determine whether you want to).
Prerequisite: INST802.

INST804 Post-Candidacy Proseminar (1 Credit)
A continuation of practical professional development for doctoral students who have successfully advanced to candidacy.
Prerequisite: INST898.

INST808 Seminar in Research Methods and Data Analysis (3 Credits)
Topics and issues in information studies research. Design and conduct of research project.
Restriction: Permission of INFO-College of Information Studies. And must be in Information Studies (Doctoral) program; or permission of instructor.
Repeatable to: 9 credits if content differs.
Credit Only Granted for: INST808, LBSC802, or INST802.
Formerly: LBSC802, INST802.

INST809 Individualized Teaching Experience (3-5 Credits)
Introduction to the techniques and challenges associated with design, delivery, and evaluation of couses offered at the University level. The doctoral student will work one-on-one with a faculty member in the development and co-teaching of a graduate level course.
Prerequisite: Must have completed 18 credit hours of doctoral course work.
Restriction: Must be enrolled in the INFS graduate program in INFO, or permission of instructor.
Repeatable to: 6 credits.
Credit Only Granted for: INST809 or LBSC774.

INST811 Pedagogy and Curriculum Development (3 Credits)
In this course, doctoral students will gradually and iteratively build a syllabus for an original course related to Information Studies. The course will cover, in sequence: curriculum models and development; learning outcome development; syllabus development; classroom management and dynamics; design of student assessments; design and delivery of classroom lectures; discussion moderation; working with teaching assistants; hybrid and online pedagogy; learning outcomes assessment; course evaluations; and teaching statements. Upon completion of the course, students will have a fully developed teaching portfolio.

INST818 Individual Research Experience (1-3 Credits)
Pre-candidacy individual research experience directed by a faculty member.
Repeatable to: 3 credits.

INST878 Special Topics in Information Studies (3 Credits)
Seminar topics offered as faculty and student interests warrant. Topic varies.
Restriction: Permission of INFO-College of Information Studies. And must be in Information Studies (Doctoral) program; or permission of instructor.
Repeatable to: 9 credits if content differs.
Credit Only Granted for: INST878 or LBSC878.
Formerly: LBSC878.

INST888 Doctoral Seminar (3 Credits)
Advanced seminar on selected topics in information studies.
Restriction: Must be in Information Studies (Doctoral) program; and permission of INFO-College of Information Studies.
Repeatable to: 6 credits if content differs.
Credit Only Granted for: INST888 or LBSC888.
Formerly: LBSC888.

INST898 Pre-Candidacy Research (1-8 Credits)

INST899 Doctoral Dissertation Research (1-8 Credits)

ISRL - Israel Studies

ISRL448 Seminar in Israel Studies (3 Credits)
Intensive study of an Israel Studies topic. Expected work product is a substantial research or analysis paper or appropriate equivalent.
Recommended: ISRL349 and ISRL249.
Restriction: Must be in the Israel Studies Minor.

ISRL449 Advanced Topics in Israel Studies (3 Credits)
Topics in the study of Zionism and contemporary Israel from the 1880s to the present at the advanced level. Individual sections may address history, politics, or culture. Some Sections may have language or course prerequisites.
Recommended: ISRL349 or ISRL249.
Repeatable to: 6 credits if content differs.

ISRL499 Advanced Independent Study in Israel Studies (1-3 Credits)
This upper-level independent study allows students to work closely with an Israel Studies faculty member of their choice, pending prior approval of the faculty member. In this independent study, students will focus on a topic specific to Israel Studies.
Prerequisite: Permission of ARHU-Meyerhoff Program & Center for Jewish Studies.
Repeatable to: 6 credits.

ISRL618 Graduate Seminar in Israel Studies (3 Credits)
An exploration of aspects of the history, politics, society, or culture of Modern Israel. Topics will vary.
Restriction: Permission of ARHU-Meyerhoff Program & Center for Jewish Studies.
Repeatable to: 12 credits if content differs.

ISRL628 Special Topics in Israeli History (3 Credits)
An exploration of aspects of the history of Modern Israel. Topics will vary.
Restriction: Permission of ARHU-Meyerhoff Program & Center for Jewish Studies.
Repeatable to: 12 credits if content differs.

ISRL638 Special Topics in Israeli Politics (3 Credits)
An exploration of aspects of Israeli politics. Topics will vary.
Restriction: Permission of ARHU-Meyerhoff Program & Center for Jewish Studies.
Repeatable to: 12 credits if content differs.

ISRL648 Special Topics in Israeli Society (3 Credits)
An exploration of aspects of Israeli society. Topics will vary.
Restriction: Permission of ARHU-Meyerhoff Program & Center for Jewish Studies.
Repeatable to: 12 credits if content differs.

ISRL658 Special Topics in Israeli Culture (3 Credits)
An exploration of aspects of Israeli culture. Topics will vary.
Restriction: Permission of ARHU-Meyerhoff Program & Center for Jewish Studies.
Repeatable to: 12 credits if content differs.

ISRL699 Independent Study in Israel Studies (3 Credits)
This graduate-level independent study allows graduate students to work closely with an Israel Studies faculty member of their choice, pending prior approval of the faculty member. In this independent study, graduate students will focus on a topic specific to Israel Studies.
Prerequisite: Permission of ARHU-Meyerhoff Program & Center for Jewish Studies.
Repeatable to: 12 credits if content differs.

ITAL - Italian

ITAL401 Advanced Composition and Style (3 Credits)
Advanced writing practice in range of genres.
Prerequisite: ITAL301; or students who have taken courses with comparable content may contact the department.

ITAL411 Monsters and Demons: the Faces of Evil in Dante's Inferno (3 Credits)
An interdisciplinary study of Dante's Inferno as represented in the Divine Comedy. Special emphasis on Dante's own portrayal of monsters and demons and their roles in the poet's eschatological vision of Hell.Taught in English

ITAL421 The Italian Renaissance (3 Credits)
A study of major trends of thought in Renaissance literature, art, and science. Taught in English.

ITAL431 Italian Civilization in Translation (3 Credits)
Political, social, intellectual, literary and artistic forces shaping contemporary Italy from the late Middle Ages to the present. Taught in English.

ITAL433 Holocaust in Italian Literature and Cinema (3 Credits)
Review of literature and theoretical writings of Italy's most famous survivor, Primo Levi, to a sampling of Italian films that focus in vastly different and often extremely controversial ways on the experience of the concentration camp, while addressing a series of central questions from the brutal realities of the camps to the "compromises" made in order to survive, the need to bear witness, and the idea of the survivor's guilt.
Cross-listed with: CINE433.
Credit Only Granted for: CINE433, FILM433 or ITAL433.
Formerly: FILM433.

ITAL436 Italian Cinema I: Neorealism (3 Credits)
Explores representations of Italy in cinema with special focus on identity formation and the movement of Italian neorealism and post neorealism. Taught in English.
Cross-listed with: CINE441.
Credit Only Granted for: CINE441, FILM441 or ITAL436.
Formerly: FILM441.

ITAL441 The Dark Side of the Italian Renaissance (3 Credits)
Examines the dark aspects of the Italian Renaissance, focusing on artistic and literary patronage as a strategy of self-promotion and as a means to achieve and preserve power. From the Northern court of Milan to the Southern Kingdom of Naples, we journey through the Italian peninsula, a land that gave birth to illustrious artists and poets in one of the most troubled periods of Italian history, marked by political conflict, bloody rivalries, family betrayals, and wars. What hides beneath the image of some of these benevolent and enlightened patrons of learning, often praised as "ideal rulers" by artists and writers of the Renaissance, are ambitious and crafty politicians, who sought their own interests and goals in their ruthless pursuit of power
Recommended: Some knowledge of Italian at the elementary or intermediate level.

ITAL469 Study Abroad Special Topics IV (1-6 Credits)
Special topics course taken as part of an approved study abroad program.
Repeatable to: 15 credits if content differs.

ITAL471 Italian Cinema: A Cultural Approach in Translation (3 Credits)
The culture of Italy through the medium of film from the silent days up to the present. Taught in English.

ITAL473 Italian Cinema II (In Translation) (3 Credits)
A study of Italian society and culture through the medium of film from the mid 1970's to the present. Taught in English.
Cross-listed with: CINE431.
Credit Only Granted for: ITAL473, CINE431 or FILM431.
Formerly: FILM431.

ITAL475 The Italian Opera Libretto in English (3 Credits)
History and analysis of Italian opera librettos from Monteverdi through Mozart to Verdi and Puccini. Taught in English.
Prerequisite: Must have completed one course in literature.

ITAL478 Colloquium in Italian (1 Credit)
Colloquium section taught in Italian to accompany 400-level Italian courses taught in English. Discussion, presentations, readings.
Prerequisite: ITAL311; or students who have taken courses with comparable content may contact the department.
Corequisite: ITAL498, ITAL411, ITAL431, ITAL421, ITAL473, ITAL475, ITAL471, or ITAL499.
Repeatable to: 6 credits.

ITAL498 Special Topics in Italian Literature (3 Credits)
Repeatable to: 6 credits if content differs.

ITAL499 Special Topics in Italian Studies (3 Credits)
Repeatable to: 6 credits if content differs.

JAPN - Japanese

JAPN401 Readings in Modern Japanese Literature (3 Credits)
Development of advanced reading, vocabulary, grammar, and translation skills through selected readings in Japanese drawn primarily from modern literature.
Prerequisite: Minimum grade of C- in JAPN302; or permission of instructor.

JAPN402 Readings in Japanese Cultural Studies (3 Credits)
Development of advanced reading, vocabulary, grammar, and translation skills through selected readings in Japanese drawn from the fields of history, social sciences, cultural studies, film studies, and popular culture.
Prerequisite: Minimum grade of C- in JAPN302; or permission of instructor.

JAPN407 The Art of Translation (3 Credits)
Theory and practice of translation. Variety of genres. Japanese to English.
Prerequisite: 1 course with a minimum grade of C- from (JAPN401, JAPN402); or students who have taken courses with comparable content may contact the department.

JAPN408 Special Topics in Japanese (3 Credits)
Topic in the Study of Japanese, to be announced each time course is offered. Taught in Japanese.
Prerequisite: Minimum grade of C- in JAPN302; or permission of instructor.

JAPN412 Classical Japanese (3 Credits)
Advanced classical Japanese.
Prerequisite: Minimum grade of C- in JAPN311; or permission of instructor.

JAPN418 Japanese Literature in Translation (3 Credits)
Representative works of Japanese literature in translation.
Repeatable to: 9 credits if content differs.

JAPN421 History of the Japanese Language (3 Credits)
Investigation of the origin of the Japanese language, its relationship with other languages, and its development. Taught in English, but presumes knowledge of Kanji (Chinese characters).
Prerequisite: JAPN102; or permission of ARHU-School of Languages, Literatures, and Cultures department.

JAPN424 Japan From the Margins (3 Credits)
Japan from the Margins takes as its focus the history and representations of various others in Japanese society. They include ethnic Ainu, Okinawans, and Koreans, a historical outcaste group called the Burakumin, and people marginalized for their non-normative gender and sexual practices. Students learn about the historical specificities of each group as well as their common experiences of institutional discrimination as they grapple with larger questions regarding prejudice, nationalism, and social justice. Taught in English.

JAPN425 The Atomic Bomb in Literature and Memory (3 Credits)
Study of declassified documents and commentary on the United States decision to use the bomb in 1945, the many ways Japanese writers have attempted to express their indescribable experiences in Hiroshima and Nagasaki, and the shaping of historical narratives and national identities in post-war Japan and the U.S. Taught in English.

JAPN428 Seminar in Japanese Discourse and Conversation Analysis (3 Credits)
Presentation and discussion of classic and current readings in English and Japanese on theories and actual practice of discourse and conversation analysis. Students will learn transcription techniques and have an opportunity to apply them in a final term paper.
Prerequisite: Must have earned a minimum grade of C- in JAPN302.
Repeatable to: 6 credits if content differs.

JAPN438 Topics in Japanese Pragmatics (3 Credits)
Basic concepts in the field of pragmatics (the study of language in context) such as deixis and indexicality, speech acts, ellipsis, and politeness. Readings in English on English and Japanese examples.
Prerequisite: JAPN201.
Recommended: JAPN422.
Repeatable to: 9 credits if content differs. Jointly offered with JAPN638.

JAPN445 Performance and Sexuality in Early Modern Japan (3 Credits)
Explores the intersections between performance and sexuality in early modern Japan. Our main sites will be the stage, the brothels, and everyday life as we examine how people of the period performed gender and sexuality. We will draw from popular fiction, kabuki, puppet theatre, woodblock prints, guides to the pleasure quarters, and censorship edicts. Taught in English.

JAPN447 Technologies of Japanese Performance (3 Credits)
Explores technologies of performance in Japan across the centuries. We will focus on concepts of likeness and liveness as they manifest in performance's mythical origins, the traditions of noh drama, the popular, commercial theatres of kabuki, bunraku, and Takarazuka, and contemporary experiments with robotics, Vocaloids, and other new technologies. Taught in English.
Cross-listed with: THET447.
Credit Only Granted for: THET447 or JAPN447.

JAPN498 Special Topics in Japanese Studies (3 Credits)
Special topics in Japanese studies. Taught in English.

JAPN499 Directed Study in Japanese (1-3 Credits)
Prerequisite: Permission of instructor.
Repeatable to: 6 credits if content differs.

JAPN608 Readings in Advanced Modern Japanese (3 Credits)
To improve reading and translation skills; readings from newspaper articles, literary works, and academic publications in the social sciences and humanities. Listening exercises are included.
Prerequisite: JAPN402; or students who have taken courses with comparable content may contact the department; or permission of ARHU-School of Languages, Literatures, and Cultures department.
Repeatable to: 6 credits if content differs.

JAPN619 Topics in Modern Japanese Literature in Translation (3 Credits)
Current topics in modern Japanese literature in English translation.
Prerequisite: Permission of ARHU-School of Languages, Literatures, and Cultures department.
Repeatable to: 9 credits if content differs.

JAPN628 Seminar in Japanese Discourse and Conversation Analysis (3 Credits)
Presentation and discussion of classic and current readings in English and Japanese on theories and actual practice of discourse and conversation analysis. Students will learn transcription techniques and have an opportunity to apply them in a final term paper.
Prerequisite: JAPN302.
Recommended: JAPN422.
Repeatable to: 6 credits if content differs.

JAPN638 Topics in Japanese Pragmatics (3 Credits)
Basic concepts in the field of pragmatics.
Prerequisite: JAPN201.
Repeatable to: 9 credits if content differs. Jointly offered with JAPN438.

JAPN679 Special Topics in Japanese Linguistics (3 Credits)
Current topics in research in Japanese linguistics.
Prerequisite: Permission of ARHU-School of Languages, Literatures, and Cultures department.
Repeatable to: 9 credits if content differs.

JOUR - Journalism

JOUR402 Journalism Law and Ethics (3 Credits)
An examination of the legal rights and ethical problems and constraints of mass media, including libel, privacy, copyright, monopoly and contempt.
Prerequisite: JOUR201.
Credit Only Granted for: JOUR402 OR JOUR400 and JOUR300.

JOUR405 Breaking News With Numbers: Statistics for Journalists (3 Credits)
Common statistical tools, software and data visualization techniques will be used to allow students to analyze data and solve problems relevant to reporting and writing about politics, sports, criminal justice, business and other fields.
Prerequisite: Minimum grade of C- in JOUR201; and (MATH107 or MATH110; or must have completed a higher level math course).
Restriction: Must be in a major in JOUR-Philip Merrill College of Journalism.

JOUR434 Salzburg Seminar: Global Media Literacy (3 Credits)
An advanced analysis of the information, values underlying messages conveyed via television, newspapers, the Internet, magazines, radio and film from a cross-cultural perspective. Examines the accuracy of messages and explores how distinctive global media shape views of politics culture and society with nations, across regions and internationally.
Restriction: Must be in Salzburg Academy program. Jointly offered with JOUR734.
Credit Only Granted for: JOUR434 or JOUR734.

JOUR435 Salzburg Seminar: Global Change, Global Cooperation (3 Credits)
Practical and theoretical examination of a global problem (or problems) of contemporary importance from a cross-cultural, perspective. Analytical framework used to examine how media shape global problems, events and/or issues regionally.
Restriction: Must be in Salzburg Academy program. Jointly offered with JOUR735.
Credit Only Granted for: JOUR435 or JOUR735.

JOUR443 Sports, Society, Culture and the Media (3 Credits)
Designed to explore how sports, society, culture and the media critically relate to each other and the vast audiences of fans and interested parties. Students will study how journalists impact change; how sports shape culture; and how sports are seen throughout the world. College sports, children and sports, the business of sports, the history of sports media and the future of sports in society will be studied as well.
Restriction: Junior standing or higher.
Credit Only Granted for: JOUR459G or JOUR443.
Formerly: JOUR459G.

JOUR447 Sports, Protest and the Media (3 Credits)
Addresses why activists, whether athletes or not, have long commanded ceremonial and ritualistic games to promote a cause or take a stand. It examines the important role of media as collectors, editors, interpreters and disseminators of information or news about athletic competitions, athletes and political pronouncements revolving around athletic events and their participants.
Credit Only Granted for: JOUR447 or JOUR458M.
Formerly: JOUR458M.

JOUR451 Advertising and Society (3 Credits)
Advertising as an institution with manifest economic purposes and latent social effects. Influences of advertising on people, and related issues of ethics and social responsibility.
Restriction: Junior standing or higher.

JOUR452 Women in the Media (3 Credits)
Participation and portrayal of women in the mass media from colonial to contemporary times.
Cross-listed with: WGSS452.
Credit Only Granted for: JOUR452, WMST452 or WGSS452.
Formerly: WMST 452.

JOUR453 Media Coverage of Diversity (3 Credits)
Analysis of media coverage of issues relating to diversity in the United States, with special attention to race, ethnicity, class, gender, sexual orientation and religious affiliation.
Restriction: Junior standing or higher.

JOUR455 Media Entrepreneurship (3 Credits)
Basic business and entrepreneurship concepts will be covered and will explore how technology is transforming the business of media. Students develop and pitch ideas for media businesses, learn startup basics, do exercises in Internet advertising and business plan analysis, use social networks and other digital communication tools, and perform other hands-on exercises in business development and presentation.

JOUR456 Literature in Journalism (3 Credits)
From Truman Capote's In Cold Blood to Mark Bowden's Black Hawk Down, students will examine how literary works can help writers approach a subject in a different way than more traditional forms of journalism, including the advantages and limitations of the style.
Credit Only Granted for: JOUR456 or JOUR673.

JOUR458 Special Topics in Journalism (3 Credits)
Issues of special concerns and current interest.
Repeatable to: 6 credits if content differs.

JOUR459 Special Topics in Journalism (1-3 Credits)
Issues of special concern and current interest. Open to all students.
Repeatable to: 6 credits if content differs.

JOUR471 Follow the Money: Reporting on Business (3 Credits)
Business and economics reporting is one of the strongest sectors of journalism with lucrative employment opportunities. This class, designed for journalism and non-journalism majors, introduces students to the main economic and business themes that dominate news coverage. Topics will include: corporate money and power in Washington, the ups and downs of the stock market, rising income inequality, the immigration crisis, why we have a trade war with China and technology disruptors. This class will be helpful to students who want to enhance their career opportunities by understanding how the economy works, why globalization is important and how the biggest corporations--including technology companies--have such a big influence on the way we live.
Restriction: Must have permission of the College of Journalism.
Credit Only Granted for: JOUR479C or JOUR471.
Formerly: JOUR479C.

JOUR472 Data Journalism (3 Credits)
A practical, skills-based course in the basics of modern data journalism, data literacy and data storytelling. Students will learn to use data visualization, data analysis and other data-driven reporting techniques.
Prerequisite: JOUR320 or JOUR360.
Jointly offered with: JOUR772.
Credit Only Granted for: JOUR472 or JOUR772.

JOUR473 Computational Journalism (3 Credits)
Designed to teach the application of computational methods in journalism and reporting. The methods include natural language processing, visualization, and web data mining. The course will also cover the necessity and impact of journalistic ethics in designing computation solutions.
Prerequisite: Permission of the Philip Merrill College of Journalism.
Cross-listed with: INST403.
Jointly offered with: JOUR773.
Credit Only Granted for: JOUR479V, JOUR473, INST408I or INST403.
Formerly: JOUR479V and INST408I.

JOUR475 Understanding Audiences and Analytics (3 Credits)
As journalism evolves, it may be more important than ever to understand what were once simply called "audiences" -- who they are, how they consume news, and what that engagement means for them and for society. Students will learn to think critically about news audiences and contemporary issues in audience research.
Prerequisite: Student must have completed a university statistics course.
Credit Only Granted for: JOUR479O or JOUR475.
Formerly: JOUR479O.

JOUR476 Researching Emerging Media in Journalism: Past, Present and Future (3 Credits)
Students will examine developments billed as innovative in the current technology-laden news ecology -- such as social media, mobile reporting and virtual reality -- and the blurring of lines between hard news, informed opinion and advocacy. While questions about the future cannot be answered with any certainty, an exploration of the past allows us to see what happened when new technologies, information systems and practices appeared as possible tools for use by journalists and the communities they served. Students will learn to use resources for researching emerging media, including UMD library databases and open access sources. The course will include presentations by the instructor, discussions, field trips, in-class exercises and student presentations. Each student will engage in a research project to understand the experience of emerging media in a decade between 1820 and 1980. Students will also write an essay contemplating current trends and the future of emerging media.
Prerequisite: Must have completed a university statistics course.

JOUR479 Special Topics in Data Gathering and Analysis (1-3 Credits)
Special research topics for reporting and writing.
Repeatable to: 3 credits.

JOUR480 Capstone Colloquium: The Business of News (1 Credit)
Students will learn the basic news business concepts and examine how revenue and cost structures for media businesses are evolving in new directions. Topics include basic principles and concepts that drive media businesses in the Internet age, including revenue sources, dynamics of online advertising and subscriptions, mobile media strategies, user metrics, engaging audiences, and market dynamics.
Restriction: Must be in a major in JOUR-Philip Merrill College of Journalism; and junior standing or higher; and permission of JOUR-Philip Merrill College of Journalism.

JOUR601 Theories of Journalism and Public Communication (3 Credits)
Survey and evaluation of current communication theories. Attention is given to the nature and function of scientific theory, models of communication behavior, the nature of information, social functions of journalism and public communication, attitude change and persuasive communication and theories of language and meaning.
Prerequisite: Permission of JOUR-Philip Merrill College of Journalism.

JOUR603 News Videography (3 Credits)
Introduction to shooting, editing and production of video stories for broadcast and the Web; includes newsgathering in the field.
Prerequisite: JOUR501 or JOUR502; or permission of JOUR-Philip Merrill College of Journalism.
Jointly offered with: JOUR347.
Restriction: Permission of JOUR-Philip Merrill College of Journalism.
Credit Only Granted for: JOUR503 or JOUR603.
Formerly: JOUR503.

JOUR604 Introduction to Multimedia Skills for Graduate Certificate Programs (3 Credits)
Examine the basics of producing and editing digital photos, video and audio for news. Topics include framing, lighting and other aspects of composition; sequencing, using wide, medium and tight shots; and ethical considerations when collecting sound and visuals.
Restriction: Permission of JOUR-Philip Merrill College of Journalism; and must not have completed JOUR504.
Credit Only Granted for: JOUR 604, JOUR504, or JOUR628G.
Formerly: JOUR628G.
Additional Information: This course is for students enrolled in graduate certificate programs in the College of Journalism.

JOUR610 Seminar in Mass Media History (3 Credits)
Analysis and discussion of the interrelationships between the mass media and society, including various social and cultural elements of modern society; responsibilities of the mass media and the mass communicator.
Credit Only Granted for: JOUR610 or JOUR710.
Formerly: JOUR710.

JOUR620 Public Affairs Reporting (3 Credits)
Designed to add to and sharpen the skills learned in JOUR501 or JOUR502. It is primarily an introduction to "beat" reporting that allows students to sample the most common new beats while reporting and writing on deadline. Students are required to develop and hone their multimedia skills by reporting in a variety of media.
Prerequisite: JOUR501 or JOUR502; or permission of JOUR-Philip Merrill College of Journalism.

JOUR623 Mobile Journalism (3 Credits)
A review of several mobile applications and the "hands-on" skills needed to collect and share news in the field. First, students learn how to remotely post information to blogs and social networks. Students then learn and practice the latest location-based production techniques using web services on wireless laptops and mobile devices. Students use laptops (and their own "SmartPhone") to record, edit and upload audio and video.
Prerequisite: Students must have basic computer skills.
Credit Only Granted for: JOUR689M or JOUR623.
Formerly: JOUR689M.

JOUR625 Advanced Capital News Service Bureau (6 Credits)
Advanced journalism training. Students report as part of College's Capital News Service program.
Prerequisite: JOUR620; and permission of JOUR-Philip Merrill College of Journalism.
Credit Only Granted for: JOUR625 or JOUR729.
Formerly: JOUR729.

JOUR627 Urban Affairs Reporting (3 Credits)
Students are immersed in coverage of issues affecting cities, working on a semester-long multi-platform reporting project based in Baltimore.
Prerequisite: JOUR501; and permission of JOUR-Philip Merrill College of Journalism.
Corequisite: JOUR620; or permission of JOUR-Philip Merrill College of Journalism. Jointly offered with JOUR327.
Credit Only Granted for: JOUR327 or JOUR627.

JOUR628 Specialized Topics in News Writing and Reporting (1-3 Credits)
Advanced training and practice in writing and reporting news. Repeatable to a maximum of six credits provided the content differs.
Credit Only Granted for: JOUR628 or JOUR728.
Formerly: JOUR728.

JOUR634 Audio and Podcast Reporting (3 Credits)
Students will learn the tools needed to report and produce short- and long-form audio storytelling, including writing, reporting, interviewing, production, editing, hosting and delivery. Field reporting and audio gathering outside of class are required, along with writing and mixing broadcast-quality audio stories. The class will produce a complete newscast on deadline, with live and pre-recorded elements. Various interests in audio reporting are welcome and encouraged.
Prerequisite: JOUR660; or permission of Philip Merrill School of Journalism Associate Dean.
Jointly offered with: JOUR334.
Formerly: JOUR668L.

JOUR635 Advanced Public Affairs Reporting: Investigative Journalism (3 Credits)
Students will learn the essentials of accountability reporting while producing a publishable, in-depth project on an issue with national significance and impact on people's lives. Substantial fieldwork, teamwork and persistence are required.
Prerequisite: JOUR620 or comparable experience.
Restriction: Permission of College of Journalism.
Credit Only Granted for: JOUR698I or JOUR635.
Formerly: JOUR698I.

JOUR636 Studio Production (3 Credits)
Moves through every production aspect related to studio production. This includes learning how to plan and execute a live studio production featuring camera crews, a floor director, producer, director, technical director, audio and teleprompter. Labs focus on executing a live newscast production. Students will also be able to go on live shots with reporters to run camera/lighting.
Prerequisite: JOUR603.
Credit Only Granted for: JOUR636, JOUR336, JOUR668L or JOUR368L.
Formerly: JOUR668L.

JOUR637 Designing Stories with Motion Graphics (3 Credits)
Students learn to create motion graphics that turn data and facts into visually compelling, animated stories, using storyboarding, scripting and Adobe software. Theories and practices of animation, design and visual journalism are discussed.
Prerequisite: Must have completed or be concurrently enrolled in JOUR652.
Credit Only Granted for: JOUR668I, JOUR637 or JOUR368I.
Formerly: JOUR668I.

JOUR652 Interactive Design and Development (3 Credits)
Conceptualize, wireframe, design and build responsive Web pages using HTML, style sheets and other coding tools; work with open source interactive tools and JavaScript libraries to create charts, timelines and maps to tell stories.
Prerequisite: Master of Journalism students must have taken or be concurrently enrolled in JOUR620; or must have permission of the Philip Merrill College of Journalism.
Recommended: Multimedia Journalism certificate students are encouraged to take or be concurrently enrolled in JOUR604.
Restriction: Must be in a major in JOUR-Philip Merrill College of Journalism.
Credit Only Granted for: JOUR652 or JOUR352.

JOUR655 Advanced Online News Bureau (6 Credits)
Advanced online journalism training. Students work as online reporters, editors and producers for a news site. Students also package copy from the print and broadcast news bureaus.
Prerequisite: JOUR603 or JOUR620; and JOUR652; or permission of JOUR-Philip Merrill College of Journalism.

JOUR657 Social Media Content Creation, Audience Engagement and Analytics (3 Credits)
Provides students with an overview of social media best practices for journalists, and will work to develop their skills in social content creation, audience engagement, sourcing and verification and analytics. By the end of this course, students will have the practical skills needed to manage a social media account for themselves or contribute to the management of a news organization's social media presence.
Corequisite: JOUR620; or permission of the department.
Credit Only Granted for: JOUR657, JOUR668D or JOUR368D.
Formerly: JOUR668D.

JOUR660 Broadcast News Writing (3 Credits)
Descriptive and critical analysis of broadcast news; methods of evaluation of news judgments; decision-making and organizational aspects of the broadcast news industry.
Prerequisite: JOUR501 or JOUR502; or permission of JOUR-Philip Merrill College of Journalism.
Credit Only Granted for: JOUR660 or JOUR760.
Formerly: JOUR760.

JOUR661 Television Reporting and Production (3 Credits)
Reporting, writing, editing and production of broadcast news.
Prerequisite: JOUR603 and JOUR660.
Restriction: Must not be in Journalism Studies (Doctoral) program.

JOUR662 Broadcast News Producing (3 Credits)
Learn and practice the basics of broadcast newscast producing. Design, write, edit and implement a news program.
Prerequisite: Must have completed JOUR603 and JOUR660.
Jointly offered with: JOUR362.
Credit Only Granted for: JOUR362 or JOUR662.

JOUR664 Advanced Audio and Podcast Reporting (3 Credits)
Students receive professional skills training in the reporting, writing, editing, voicing and production of radio news. Students will be required to do extensive field reporting, along with writing and mixing broadcast-quality radio pieces. They will also participate in other aspects of radio news production, including editing, directing, live interviewing and hosting. By the end of the semester, students will have created all the elements of a complete radio broadcast, including news spots, finished pieces, two-ways and a long-form audio segment. The class will also delve into the history and evolution of radio news and its future in podcasting and other forms.
Prerequisite: JOUR634; or permission of JOUR-Philip Merrill College of Journalism.
Jointly offered with: JOUR364.
Restriction: Permission of JOUR-Philip Merrill College of Journalism.

JOUR667 Broadcast News Bureau (6 Credits)
Advanced broadcast journalism training. Students report as part of the College's Capital News Service program.
Prerequisite: JOUR661.
Jointly offered with: JOUR367, JOUR357.

JOUR668 Topics in Broadcasting and Electronic Media (1-3 Credits)
Advance research and analysis of selected topics in broadcast journalism.
Repeatable to: 6 credits if content differs.
Credit Only Granted for: JOUR668 or JOUR768.
Formerly: JOUR768.

JOUR670 Photojournalism (3 Credits)
Examining the basics of shooting, editing and storytelling with still photos taken with 35mm digital cameras. Students shoot portraits, feature photos and action shots. Final project is a photo story/essay.
Prerequisite: JOUR620.
Jointly offered with: JOUR370.
Restriction: Must be in a major in JOUR-Philip Merrill College of Journalism; and permission of JOUR-Philip Merrill College of Journalism.
Credit Only Granted for: JOUR368P, JOUR370 or JOUR670.
Additional Information: Students are required to borrow, rent or purchase a 35mm digital camera. Contact department for camera specifications.

JOUR681 Media Industry Reporting (3 Credits)
Students hone their reporting and writing skills as they produce work for the Web site of an award-winning professional publication, and immerse themselves in the news industry, which is undergoing dramatic transformation in the digital age.
Prerequisite: JOUR501; or permission of JOUR-Philip Merrill College of Journalism.
Corequisite: JOUR620; or permission of JOUR-Philip Merrill College of Journalism.
Jointly offered with: JOUR381.
Restriction: Permission of JOUR-Philip Merrill College of Journalism.
Credit Only Granted for: JOUR381 or JOUR681.

JOUR682 Sports Reporting and Writing (3 Credits)
Gives students wide-ranging instruction in all aspects of sports reporting and writing, from the history of the craft to its mechanics, including how to report, write, edit and lay out sports stories, incorporating multimedia and interactive elements. Ethics, objectivity, fairness and the future of sports journalism will be discussed.
Prerequisite: JOUR620.
Jointly offered with: JOUR382.
Credit Only Granted for: JOUR628B, JOUR682 or JOUR382.
Formerly: JOUR628B.

JOUR683 Advanced Photojournalism (3 Credits)
Provides a deeper dive into the storytelling medium of photojournalism. Students will learn the skills necessary to tell in-depth, long-term stories through the use of still photography. Topics of discussion will include the history of photojournalism, changing approaches to the photo story/essay over time, how to approach a variety of potential subject matters and situations, finding long-term photo story projects and organizing images for a variety of digital and traditional formats.
Prerequisite: JOUR670.
Jointly offered with: JOUR383.
Restriction: Permission of JOUR-Philip Merrill College of Journalism.
Credit Only Granted for: JOUR668N or JOUR683 .
Formerly: JOUR668N.

JOUR689 News Coverage of Specialized Topics (1-3 Credits)
Advance training and practice in writing and reporting news in on specialized field of interest.
Prerequisite: JOUR620; or JOUR660.
Repeatable to: 6 credits if content differs.

JOUR698 Special Problems in Communication (1-3 Credits)
Independent study in area of the student's interest.
Repeatable to: 6 credits.

JOUR702 Journalism Law and Ethics (3 Credits)
An examination of the legal rights and ethical problems and constraints of mass media, including libel, privacy, copyright, monopoly and contempt.
Restriction: Must be in one of the following programs (Journalism - Master (Master's); Journalism Studies (Doctoral)) ; or permission of JOUR-Philip Merrill College of Journalism.
Credit Only Granted for: JOUR400, JOUR 600, JOUR700, or JOUR 702.

JOUR722 Mediacentric Politics (3 Credits)
Examination of the growing use of the media image and issues in electorial politics and interest-group advocacy.
Prerequisite: JOUR601.

JOUR725 Political Communication (3 Credits)
Critical examination of the interplay between the media, government and the political process.
Prerequisite: JOUR601 or JOUR801.

JOUR729 Reporting from Annapolis and Washington (6 Credits)
Advanced training in public affairs journalism. Students report state and federal news as part of College's Capital News Service.
Repeatable to: 12 credits if content differs.

JOUR734 Salzburg Seminar: Global Media Literacy (3 Credits)
An advanced analysis of the information, values and underlying messages conveyed via television, newspapers, the Internet, magazines, radio and film from a cross-cultural perspective. Examines the accuracy of messages and explores how distinctive global media shape view of politics, culture and society within nations, across regions and internationally.
Restriction: Must be in Salzburg Academy program. Jointly offered with JOUR434.
Credit Only Granted for: JOUR434 or JOUR734.

JOUR735 Salzburg Seminar: Global Change, Global Cooperation (3 Credits)
Practical and theoretical examination of a global problem (or problems) of contemporary importance from a cross-cultural, perspective. Analytical framework used to examine how media shape global problems, events and/or issues regionally.
Restriction: Must be in Salzburg Academy program. Jointly offered with JOUR435.
Credit Only Granted for: JOUR435 or JOUR735.

JOUR738 Topics in International and Cross-Cultural Communication (3 Credits)
Specialized topics in the fields of comparative journalism and mass communications and in the field of cross-cultural communication.
Repeatable to: 6 credits if content differs.

JOUR757 History of Investigative Journalism (3 Credits)
Teaches the history of investigative journalism in the U.S., focusing on key time periods from colonial times to the present.
Credit Only Granted for: JOUR757, JOUR779I, JOUR459I, or JOUR457.
Formerly: JOUR779I.

JOUR763 Seminar in Newsroom Management (3 Credits)
Organization, operation, and administration of the departments of a newsroom: advertising, business-finance, circulation, news-editorial, personnel, production and promotion.
Credit Only Granted for: JOUR481, JOUR675, or JOUR763.
Formerly: JOUR675.

JOUR772 Data Journalism (3 Credits)
A practical, skills-based course in the basics of modern data journalism, data literacy and data storytelling. Students will learn to use data visualization, data analysis and other data-driven reporting techniques.
Prerequisite: Must have completed JOUR502, or students who have taken courses with comparable content may contact the department.
Jointly offered with: JOUR472.
Credit Only Granted for: JOUR772 or JOUR472.

JOUR773 Computational Journalism (3 Credits)
Designed to teach the application of computational methods in journalism and reporting. The methods include natural language processing, visualization, and web data mining. The course will also cover the necessity and impact of journalistic ethics in designing computation solutions.
Prerequisite: Permission of the Philip Merrill College of Journalism.
Cross-listed with: INST617.
Jointly offered with: JOUR473.
Credit Only Granted for: JOUR779V, JOUR773, JOUR473, JOUR479V, INST617, INST408I, or INST403.
Formerly: JOUR779V.

JOUR775 Quantitative Methods in Journalism and Public Communication Research (3 Credits)
Logic and methods of quantitative data collection and statistical analysis as applied to journalism and public communication studies.
Credit Only Granted for: JOUR701 or JOUR775.
Formerly: JOUR701.

JOUR776 Qualitative Research Methods in Journalism and Public Communication (3 Credits)
Methods of historical, critical and field research in journalism and public communication. Formulation of significant research questions, systematic collection of bibliographic and phenomenal information, formulating substantial claims, organizing and writing research for disciplinary outlets.
Credit Only Granted for: JOUR711 or JOUR776.
Formerly: JOUR711.

JOUR777 Advanced Historical/Critical Methods in Journalism and Public Communication (3 Credits)
Critical assessment of qualitative approaches to public communication. Introduction to significant schools of historical and critical research. Advanced techniques for inquiry and manuscript preparation. Students must have a dissertation research project requiring historical or critical theory.
Credit Only Granted for: JOUR712 or JOUR777.
Formerly: JOUR712.

JOUR779 Seminar in Research Problems (1-3 Credits)
Methods of research design and analysis in specialized areas of journalism and public communication research.
Repeatable to: 6 credits if content differs.
Credit Only Granted for: JOUR779 or JOUR780.
Formerly: JOUR780.

JOUR798 Master's Professional Fieldwork (1-6 Credits)
Research for and preparation of news articles or programs for use in the media. Analysis of fieldwork experience using communication theory and research results. Fieldwork may be done independently or as an internship. Repeatable to a maximum of six credits.
Repeatable to: 6 credits.

JOUR799 Master's Thesis Research (1-6 Credits)

JOUR800 Introduction to Doctoral Study in Journalism and Public Communication (3 Credits)
Basic skills in journalism and public communication research.
Credit Only Granted for: JOUR700 or JOUR800.
Formerly: JOUR700.

JOUR801 Advanced Public Communication Theory (3 Credits)
Advanced selected survey of communication & media theory.
Prerequisite: JOUR601, or students who have taken courses with comparable content may contact the department.

JOUR808 Doctoral Colloquium (1-3 Credits)
Guided discussion of professional and theoretical topics.
Prerequisite: Must have completed or be concurrently enrolled in JOUR800.
Repeatable to: 4 credits if content differs.

JOUR818 Seminar in Communication Theories and Journalism Practice (3 Credits)
Critical examination of existing theory and/or journalism practices suggesting hypotheses and formulating proposals for future research.
Prerequisite: Must have completed or be concurrently enrolled in JOUR800.
Repeatable to: 6 credits if content differs.

JOUR888 Doctoral Professional Field Work (1-9 Credits)
Critical analysis of a phase of a professional field in journalism and public communication. Analysis of professional activity through personal observation. Evaluation of the purpose, process, effectiveness, and efficiency of professional activity. Recommendations for training and further research.
Repeatable to: 9 credits if content differs.
Formerly: PCOM888.

JOUR889 Doctoral Tutorial in Journalism and Public Communication (1-9 Credits)
Individual research in journalism and public communication.
Repeatable to: 9 credits if content differs.
Formerly: PCOM889.

JOUR898 Pre-Candidacy Research (1-8 Credits)

JOUR899 Doctoral Dissertation Research in Journalism and Mass Communication (1-8 Credits)
Formerly: PCOM899.

JWST - Jewish Studies

JWST408 Honors Seminar in Jewish Studies (3 Credits)
An in-depth exploration of a theme in Jewish history, literature, culture or thought. Course subject and readings will vary from year to year, but will generally cut across periods, locations, or disciplines. Students are expected to engage the course material critically and to use the seminar as an opportunity to develop an independent research agenda.
Prerequisite: Permission of ARHU-Meyerhoff Program & Center for Jewish Studies.
Restriction: Junior standing or higher.

JWST409 Research Seminar in Jewish Studies (3-4 Credits)
A capstone course for Jewish Studies. Guides students through advanced source material and subject matter, research skills, and presentation techniques. A substantive paper based on independent research and analysis is one expected outcome.
Prerequisite: Must have completed two upper-level courses in an appropriate area of Jewish Studies; or permission of ARHU-Meyerhoff Program & Center for Jewish Studies.
Repeatable to: 9 credits if content differs.
Formerly: JWST309.

JWST418 Honors Thesis Research in Jewish Studies (3-6 Credits)
Guided research on a thesis under the supervision of the Jewish Studies faculty.
Repeatable to: 6 credits if content differs.

JWST419 Special Topics in Jewish Studies (3 Credits)
Repeatable to: 9 credits if content differs.

JWST427 The Epic of Gilgamesh (3 Credits)
One of the most famous tales from the ancient world, the Epic of Gilgamesh inspires readers with tales of friendship and loss, mortality, and the search for meaning. The story itself grew and changed over time and took on new meanings. Through study of the epic, its development over time, and the sources it drew from, this class will examine the meaning of the Gilgamesh epic and its impact on ancient Mesopotamian culture.
Prerequisite: JWST225, RELS225, HIST219I, or permission of the instructor.
Recommended: JWST262, ENGL262, or HEBR298B.
Cross-listed with: RELS427.
Credit Only Granted for: JWST419G, RELS419G, RELS427 or JWST427.
Formerly: JWST419G.

JWST429 Advanced Topics in Jewish Studies (3-4 Credits)
Special topics at an advanced level for Jewish Studies. Primarily intended for majors and graduate students.
Repeatable to: 12 credits if content differs.

JWST430 Dead Sea Scrolls (3 Credits)
A study of the Dead Sea Scrolls in their ancient and modern settings, and in terms of contemporary scholarly interpretations of their meaning. Interpretations of the historical significance of these documents, their connections to ancient Jewish sectarian movements, and their implications for our understanding of Judaism, Christianity, and the history of the Bible.
Prerequisite: Must have completed one JWST course or one RELS course; or permission of ARHU-Meyerhoff Program & Center for Jewish Studies. Cross-listed with RELS430.
Credit Only Granted for: JWST430 or RELS430.

JWST432 Jews in Medieval Times 1000-1450 (3 Credits)
Social and cultural life of Jewish communities spread throughout Islam and Christendom. Major topics include the Gaonate, kehila organizations, legal, rationalist, and mystical thought, and the context of rising animosity against Jews linked to the Crusades and changing Church doctrines.
Recommended: HIST282, HIST330, HIST331, or JWST234.
Cross-listed with: HIST476.
Credit Only Granted for: HIST476 or JWST432.

JWST452 The Golden Age of Jewish Philosophy (3 Credits)
Jewish philosophy from Maimonides in the 12th century to the expulsion of the Jews from Spain at the end of the 15th Century. Topics include the limitations of human knowledge, creation of the world, foreknowledge and free will, and the existence of God.
Prerequisite: 3 credits in PHIL courses; or permission of ARHU-Meyerhoff Program & Center for Jewish Studies; or permission of ARHU-Philosophy department.
Cross-listed with: PHIL417.
Credit Only Granted for: JWST452 or PHIL417.

JWST459 Readings in Medieval Hebrew (3-4 Credits)
Readings and analysis of Hebrew texts and literature from the Middle Ages. Language of instruction in English; all texts in Hebrew.
Repeatable to: 9 credits if content differs.
Credit Only Granted for: JWST459 or JWST466.
Formerly: JWST466.

JWST468 Readings in the Hebrew Bible (3-4 Credits)
Readings in the Hebrew text of the Bible. Emphasis in close reading, grammar analysis, and modern interpretations of the Bible. Language of instruction English; all texts in Hebrew.
Prerequisite: HEBR313; or permission of instructor.
Repeatable to: 9 credits if content differs.
Formerly: HEBR441 and HEBR442.

JWST469 Readings in Rabbinic Hebrew (3-4 Credits)
Readings in classical rabbinic texts and related corpora. Emphasis on grammar and reading skills as well as critical analysis of the material. Language of instruction: English; all texts in original language.
Prerequisite: HEBR313; or permission of instructor.
Repeatable to: 9 credits if content differs.

JWST471 Modern Hebrew Literature in Translation (3 Credits)
An exploration of modern Hebrew prose, poetry, and literary essays written from the 1880s through the present in Europe, Palestine, and Israel. An investigation of the challenges confronting authors such as Mendele Mokher Sforim, Avraham Mapu, Chaim Nahman Bialik, Dvorah Baron, S.Y. Agnon, and David Fogel as they tried to create a contemporary secular literature out of an ancient sacred language. All texts in English translation.

JWST478 Readings in Modern Hebrew (3 Credits)
Variable topics in Modern Hebrew Literature.
Prerequisite: HEBR313; or permission of instructor.
Restriction: Junior standing or higher.
Repeatable to: 12 credits if content differs.

JWST491 Judaism and the Construction of Gender (3 Credits)
The study of Jewish culture, religious practice, communal authority, and literature through the frame of such critical categories of analysis as gender, sexuality, masculinity, power, ethics, and the feminine.
Prerequisite: 1 course in JWST; or 1 course in LGBT; or 1 course in WMST or WGSS.
Cross-listed with: WGSS491.
Credit Only Granted for: JWST491, WMST491 or WGSS491.
Formerly: WMST491.

JWST492 Sex, Gender, and Jewish Identity (3 Credits)
An exploration of Jewish embodiment, including dynamics related to biological sex, culturally-framed gender, and sexuality. Topics of discussion may include transgender and intersex Jews, stereotypes and gender performance, modesty, genetics, and body alteration. Focus is on contemporary Jewish culture, framed within the larger historical and textual tradition.
Prerequisite: 1 course in WGSS; or 1 course in JWST; or 1 course in LGBT; or permission of instructor.
Cross-listed with: LGBT448W, WGSS492.
Credit Only Granted for: JWST492, JWST409G, LGBT448W, WMST498W or WGSS492.
Formerly: WMST498W and JWST409G.

JWST498 Advanced Language Module for Jewish Studies (1-3 Credits)
A supplementary language module for students enrolled in designated Jewish Studies classes. Language of instruction English, texts in original language.
Prerequisite: HEBR212 or JWST282; or permission of ARHU-Meyerhoff Program & Center for Jewish Studies.

JWST499 Independent Study in Jewish Studies (1-3 Credits)
Prerequisite: Permission of ARHU-Meyerhoff Program & Center for Jewish Studies.
Repeatable to: 6 credits if content differs.

JWST600 General Seminar in Jewish Studies (3 Credits)
Introduce graduate students to the fields, problems, and basic methods of research in the comtemporary practice of Jewish Studies. Consideration of chronological and historiographical problems, questions of the development of Jewish thought and literature and Jewish religious and cultural history in four rough chronological periods: Biblical Israel, Judaism in Antiquity, Judaism in the Middle Ages and Early Modern Period, and Modern Judaism.

JWST609 Supervised Instruction-Practicum in Jewish Studies (1 Credit)
Supervised instruction or supervised practicum in Jewish Studies. Intended for graduate students whose course work includes field work or classroom teaching.
Prerequisite: Permission of ARHU-Meyerhoff Program & Center for Jewish Studies.

JWST619 Directed Readings in Jewish Studies (3 Credits)
Independent Study in Jewish Studies. Readings and papers.
Prerequisite: Permission of ARHU-Meyerhoff Program & Center for Jewish Studies.
Repeatable to: 12 credits if content differs.

JWST648 Readings in Jewish History (3 Credits)
Focus on the central issues in Jewish history as well as the key historiographical debates on those issues.
Repeatable to: 9 credits if content differs.

JWST658 Readings in Jewish Thought and Culture (3 Credits)
Examines key issues in the development of Jewish thought and culture.
Repeatable to: 9 credits if content differs.

JWST678 Readings in Jewish Literature (3 Credits)
Examines selected themes or literatures in the development of Jewish literary traditions.
Repeatable to: 9 credits if content differs.

JWST699 Independent Graduate Readings in Jewish Studies (1-3 Credits)
Independent readings or guided research in a field of Jewish Studies with a member of the Jewish Studies graduate faculty.
Prerequisite: Permission of ARHU-Meyerhoff Program & Center for Jewish Studies.
Repeatable to: 12 credits if content differs.

JWST719 Readings in Jewish Studies (3 Credits)
Course exposes students to significant primary and secondary material on selected topics as well as the major methodological problems covered by professional scholars working on these topics.
Repeatable to: 99 credits if content differs.

JWST799 Masters Thesis Research (1-6 Credits)
Research and Writing the Masters Thesis in Jewish Studies.
Repeatable to: 6 credits.

KNES - Kinesiology

KNES401 Zip Code: Prediction of Physical Activity & Health (3 Credits)
An exploration of the relationship and impacts of built and other social environments on health, including physical activity, social equity, gentrification, and many others.
Prerequisite: Minimum grade of C- in SPHL100.
Restriction: Must have earned a minimum of 75 credits; and must be in a major within, SPHL-Kinesiology department.

KNES402 Biomechanics of Sport (3 Credits)
Mechanical determinants influencing sport techniques. A quantitative, scientific basis for sport analysis with emphasis on the application to numerous sport activities. Evaluation and quantification of the filmed performance of athletes.
Prerequisite: Minimum grade of C- in KNES300.
Restriction: Must be in a major within the SPHL-Kinesiology department; and must have earned a minimum of 75 credits.

KNES405 Principles & Techniques of Manual Muscle Testing (3 Credits)
It is critical for sports medicine and sport performance specialists to understand the location and inter-relationships of the structures of the body that impact human movement. Thus, the primary purpose of this course is to facilitate an in-depth, understanding of the muscles of the body. Specifically, students will learn the origins, insertions, primary and secondary functions, as well as nervous innervations of the major muscle groups of the body. In addition, students will develop palpation skills and learn to grade the function of each muscle through manual muscle testing techniques. These skills form the foundation for assessing functional movement as well as performing safe and effective manual therapy techniques. Thus, while the focus of the class will be to develop sound, introductory palpation and manual muscle testing skills, basic principles of functional movement and manual therapy will also be addressed through hands-on application as well as case study.
Prerequisite: Minimum grade of C- in BSCI201 and BSCI202; and 1 course with a minimum grade of C- from Kinesiology core courses at the 300-level or higher.
Restriction: Must be in a major within the SPHL-Kinesiology department; and must have earned a minimum of 90 credits.

KNES406 Clinical Biomechanics: Musculoskeletal Injury (3 Credits)
An in-depth analysis of the biomechanical foundations underlying musculoskeletal injury. Emphasis is placed on the biomechanical mechanisms responsible for injury causation, the resultant effects on musculoskeletal tissues, and the current scientific understanding of strategies for injury prevention.
Prerequisite: Minimum grade of C- in KNES300.
Restriction: Must be in a major within the SPHL-Kinesiology department; and must have earned a minimum of 75 credits.
Credit Only Granted for: KNES406 or KNES498V.
Formerly: KNES498V.

KNES411 Black Bodies & Green Space: From 1619 to Today (3 Credits)
Nature-based physical activity, also known as green exercise, involves engaging in physical activity within natural environments like parks, forests, or other green spaces. But, access or a sense of belonging to these spaces has not and still is not equitable. This experiential course will take a historical look as to why that has been the case...From the enslaved African on antebellum plantations, who used the surrounding uncultivated land as a place of deliverance, healing and route to freedom, to the Central Park bird watcher, whose green space presence was perceived as a threat to White physical safety, we will critically examine how systemic racism shaped the experience, connection, and relationship to nature among Black Americans.
Prerequisite: Minimum grade of C- in KNES285.
Restriction: Must have earned a minimum of 75 credits.
Credit Only Granted for: HNUH218Y or KNES411.
Formerly: HNUH218Y.

KNES440 Psychology of Athletic Performance (3 Credits)
Examines the psychological factors, mechanisms, and processes in athletic performance. Utilizes a social psychological approach to focus on the study and review of individual performance in both the interpersonal and social context.
Prerequisite: Minimum grade of C- in KNES350.
Restriction: Must have earned a minimum of 75 credits.

KNES442 Psychology of Exercise and Health (3 Credits)
Examines the antecedents and consequences of exerciese behavior. Explores motivation, attitude, control, socialization. Proposes intervention strategies at the individual, organizational and societal levels.
Prerequisite: Minimum grade of C- in KNES350.
Restriction: Must be in a major within the SPHL-Kinesiology department; and must have earned a minimum of 75 credits.

KNES445 Exercise and Brain Health (3 Credits)
Examines the evidence for exercise to affect brain function and brain health in children, in adults, and in old age. Covers the adaptations to acute and chronic exercise within brain networks related to emotion, stress reactivity, memory, and executive function, and the effectiveness of physical activity and exercise as treatments for depression, anxiety disorders, and cognitive impairment.
Prerequisite: Minimum grade of C- in KNES350.
Restriction: Must be in a major within the SPHL-Kinesiology department; and must have earned a minimum of 75 credits.

KNES450 From the Olympics to the Rehabilitation Clinic: Mental Skills Training Applications (3 Credits)
The examination and application of the major concepts of human performance psychology in, and beyond, the professional, collegiate, amateur and youth sport athletic spaces to allied health practitioner (PT, OT, OR, PA, RN), athletic and personal training, and tactical athlete (i.e., military, law enforcement, and firefighting) environments. An essential component of the class will be the reliance on reading and reviewing both classic articles and the recent evidence-based research in which applied strategies and techniques are based. Students will be taught to critically analyze the research by 1) understanding the purpose of the research, 2) identifying the experimental design and how it contrasts the difference between experimental and control conditions, 3) understanding the outcome of the research, and 4) understanding how the outcome of the research may be applicable to the human performance and allied health environments.
Prerequisite: Minimum grade of C- in KNES350.
Restriction: Must be in a major within the SPHL-Kinesiology department; and must have earned a minimum of 75 credits.
Credit Only Granted for: KNES498G or KNES450.
Formerly: KNES498G.

KNES451 Children and Sport: A Psychosocial Perspective (3 Credits)
Examination of youth sports from a psychosocial perspective, including the impact of highly structured sports on young athletes and the complex social network of coaches, parents and peers.
Prerequisite: Minimum grade of C- in KNES350.
Restriction: Must be in a major within the SPHL-Kinesiology department; and must have earned a minimum of 90 credits.

KNES457 Managing Youth Programs: Educational, Fitness and Sport (3 Credits)
An examination of the basic functions involved in managing physical education, fitness, and youth sports programs. Focus on leadership skills, organizational management, and techniques for applying learned skills in a variety of organizational settings that serve the nation's youth.
Prerequisite: Minimum grade of C- in KNES350 and KNES370.
Restriction: Must be in a major within the SPHL-Kinesiology department; and must have earned a minimum of 75 credits.

KNES460 Physiology of Aging and the Impact of Physical Activity (3 Credits)
Biology of the aging process in healthy individuals and those with chronic disease, the effects of acute exercise and exercise training on the physiological decline that occurs in humans, and the role that regular physical activity plays on enhancing the quality of life and activities of daily living in individuals.
Prerequisite: 1 course with a minimum grade of C- from (KNES320, KNES360).
Restriction: Must be in one of the following programs (Kinesiology; Public Health Science); and must have earned a minimum of 75 credits.

KNES462 Neural Basis of Human Movement (3 Credits)
An introduction to the neural substrates which underlie postural and volitional movement. Neuroanatomical and neurophysiological basis of motor functioning; past and present conceptualizations of motor control and coordination; movement disorders; and maturation of the neuromuscular system. Students with career goals in allied health or medical fields will benefit from this overview of both the peripheral and the central nervous system, with a special focus on the control of motor behavior. Topics covered will range from neural signaling to sensory processing, to central control of movement, and to relevant 'higher' cognitive processes pertaining to movement execution and recovery.
Prerequisite: Minimum grade of C- in BSCI201, BSCI202, and KNES385; or permission of SPHL-Kinesiology department.
Restriction: Must have earned a minimum of 75 credits.

KNES463 Type 2 Diabetes and Physical Activity Seminar (3 Credits)
Students will examine and critically analyze the current research literature relevant to the diagnosis, prevalence, and impact of the current diabetes epidemic in the US. Students will also study the current state of knowledge relative to the use of physical activity to prevent and treat diabetes. This seminar format class is heavily based on student presentations, student participation, and student writing assignments.
Prerequisite: Minimum grade of C- in KNES360.
Restriction: Must be in the Kinesiology major; and must have earned at least 75 credits.
Credit Only Granted for: KNES498D or KNES463.
Formerly: KNES498D.

KNES464 Exercise Metabolism: Role in Health and Disease (3 Credits)
Examines the role of metabolism in kinesiology, especially as it relates to physical inactivity, health and disease. Includes bioenergetics, substrate utilization, cell signaling, and metabolic gene expression and their impact on chronic health conditions or disease.
Prerequisite: Minimum grade of C- in KNES360.
Restriction: Must have earned a minimum of 75 credits.

KNES465 Physical Activity and Disease Prevention and Treatment (3 Credits)
Critically examines the scientific evidence that supports the use of physical activity to prevent and treat age-related diseases, including cardiovascular disease, diabetes, abnormal lipoprotein-lipid levels, hypertension, obesity, osteoporosis and cancer.
Prerequisite: 1 course with a minimum grade of C- from (KNES320, KNES360).
Restriction: Must have earned a minimum of 75 credits.

KNES466 Graded Exercise Testing (3 Credits)
Functional and diagnostic examination of the cardiovascular responses to graded exercise testing. Emphasis on electrophysiology, mechanisms of arrhythmias, normal electrical activation of the heart, axis termination and the normal 12-lead electrocardiogram.
Prerequisite: Minimum grade of C- in KNES360.
Restriction: Must be in a major within the SPHL-Kinesiology department; and must have earned a minimum of 75 credits.

KNES467 Physical Activity & the Treatment & Prevention of Obesity (3 Credits)
Students will examine and critically analyze the current research literature relevant to the diagnosis, prevalence, and impact of the current obesity epidemic in the US. Students will also study the current state of knowledge relative to the use of physical activity to prevent and treat obesity. This seminar format class is heavily based on student presentations, student participation, and student writing assignments. The course is primarily based on presentations by the instructor and the students followed by in depth discussions of the implications of the data.
Prerequisite: Minimum grade of C- in KNES360.
Restriction: Must have earned a minimum of 75 credits.
Credit Only Granted for: KNES467 or KNES498O .
Formerly: KNES498O.

KNES471 Assistive Technologies for Restoration of Human Motor Functions (3 Credits)
Presents the main assistive technologies and their applications for rehabilitation of individuals whose daily motor activities such as mobility and object manipulations are difficult or impossible. Students will learn how rehabilitative technologies work and understand their effectiveness to restore human movements. Students will learn how performance is evaluated in individuals operating rehabilitative technologies. This course will allow students to better understand assistive technology and their utilization for individuals with motor disabilities at work, at home and in the community. This course is particularly relevant for students who wish to pursue a career in rehabilitation and allied health.
Prerequisite: Minimum grade of C- in BSCI201, BSCI202, and KNES385; and a minimum grade of C- in MATH113 or higher.
Recommended: KNES265 or PHYS121. Basic knowledge of MS Excel or Matlab.
Restriction: Must have earned a minimum of 75 credits and must be in a major within SPHL-Kinesiology department.

KNES474 Quantitative Methods in Cognitive Motor Behavior - MATLAB (3 Credits)
Includes basic computer programming, algorithm, and quantitative techniques for time-series data with an emphasis on, but not limited to, human movement. These topics will be taught using MATLAB, a programming language and environment for numerical computation, data analysis, and visualization.
Prerequisite: MATH115 or equivalent; or permission of Kinesiology department.
Recommended: MATH240.
Restriction: Must have earned a minimum of 75 credits.

KNES476 Honors Thesis Proposal (3 Credits)
Development of honors thesis proposal based on preliminary research and literature review. Presentation of formal proposal to the thesis committee and fellow honors students.
Corequisite: KNES478.
Restriction: Must be a KNES Honors student; and senior standing.

KNES477 Honors Thesis (3 Credits)
Advisement will be on the individual basis. Thesis must be defended in the honors seminar.
Prerequisite: KNES476.
Corequisite: KNES478.
Restriction: Must be a KNES Honors student; and senior standing.

KNES478 Honors Seminar (1-3 Credits)
Guided discussion of research topics of current interest.
Restriction: Must be a KNES Honors student; and junior standing or higher.
Repeatable to: 4 credits if content differs.

KNES482 Socio-behavioral Aspects of Human Movement (3 Credits)
Derivation, formulation, and application of research in the socio-behavioral aspects of human movement.
Prerequisite: KNES293, KNES350, and KNES287.

KNES483 Sport Marketing and Media (3 Credits)
Industry practices in sport marketing and media. Marketing strategies and consumer behavior in different sport contexts. Critical examination of selected social and economic issues related to the buying and selling of sport.
Prerequisite: Minimum grade of C- in KNES287.
Recommended: KNES355.
Restriction: Must be in a major within the SPHL-Kinesiology department; and must have earned a minimum of 75 credits.

KNES484 Sporting Hollywood (3 Credits)
Popular representations of sport within the film media related to wider social discourses on bodies and the politics of various categories of subjectivity (gender, sex, race, class and nationality).
Prerequisite: Minimum grade of C- in KNES285 and KNES287.
Restriction: Must be in a major within the SPHL-Kinesiology department; and must have earned a minimum of 75 credits.

KNES485 Sport and Globalization (3 Credits)
Examination of sport culture from a global perspective; focuses on theorizing the similarities and differences between various national sporting cultures.
Prerequisite: Minimum grade of C- in KNES287.
Restriction: Must be in a major within the SPHL-Kinesiology department; and must have earned a minimum of 75 credits.

KNES487 Women, Sports and Culture (3 Credits)
A study of the historical barriers to women's participation in physical activity, efforts to dismantle those barriers, and the differentiation that exists in women's sport and physical culture today. Exploration of the historical and contemporary factors involving female athletes in U.S. culture.
Prerequisite: Minimum grade of C- in KNES287.
Restriction: Must be in a major within the SPHL-Kinesiology department; and must have earned a minimum of 75 credits.

KNES497 Kinesiology Senior Seminar (3 Credits)
Discussions of contemporary issues vital to the discipline, critiques of research in the student's area/areas of special interest, completion of a major project where the student will be asked to demonstrate the ability to carry out investigative processes in problem solving and critical writing under faculty direction.
Prerequisite: A professional writing course with a minimum grade of C-; and must have completed 6 KNES core courses and 2 KNES option courses, all with a C- or higher; and must have completed STAT100 with a C- or better.
Restriction: Senior standing or higher; and must be in Kinesiology program; and permission of department.

KNES498 Special Topics in Kinesiology (3 Credits)
Topics of special interest in areas not covered by regularly scheduled courses.
Prerequisite: Permission of SPHL-Kinesiology department.
Repeatable to: 99 credits if content differs.

KNES600 Kinesiology in Public Health (3 Credits)
A broad introduction to public health within the context of the discipline of kinesiology, focusing on furthering the understanding of the ways kinesiology contributes toward achieving the goals of public health.

KNES601 Epidemiology of Physical Activity (3 Credits)
An exploration of basic epidemiological study design, methods, and health outcomes in the field of physical activity.
Prerequisite: KNES600; and must have completed an undergraduate statistics course (e.g., STAT100 or equivalent).

KNES602 Physical Activity Program Planning and Evaluation (3 Credits)
An in-depth analysis of the planning, implementation, and evaluation of physical activity interventions and programs intended to achieve physical activity and public health goals.
Recommended: KNES600.

KNES603 Research Methods in Kinesiology & Public Health (3 Credits)
The purpose of this course is to expose students: (1) to some of the key issues involved in physical activity and public health related research, and (2) the process of conducting and communicating research. In addition to learning the central aspects of a range of quantitative and qualitative research methods, students will gain practice evaluating and synthesizing existing research, as well as writing a research proposal specific to a topic of their choice.
Prerequisite: KNES600, KNES601, and KNES602.

KNES604 Development of Posture and Locomotion (3 Credits)
Development of posture and locomotion in humans integrating the perspectives of biomechanics, neurophysiology, perception-action theory and dynamical systems.

KNES609 Research Issues in Kinesiology (1-3 Credits)
Issues, methodologies, and critical analyses of current research in Kinesiology.
Prerequisite: Permission of SPHL-Kinesiology department.
Repeatable to: 6 credits.

KNES610 Methods and Techniques of Research (3 Credits)
Studies methods and techniques of research used in Kinesiology; an analysis of examples of their use; and practice in their application to problems of interest to the student.

KNES612 Qualitative Research Methods in Physical Cultural Studies (3 Credits)
Prepares students to design, prepare, and produce independent research projects in Physical Cultural Studies (PCS). Topics include: the philosophy of PCS through its epistemological, ontological, and axiological bases; the politics of PCS as an interventionist project; and the practice of PCS as critical pedagogy, within research methodologies, and through the ways in which PCS work is analyzed and expressed.

KNES613 Theories Physical Culture (3 Credits)
Examines and assesses numerous social and cultural theories as frameworks for critically interpreting the varied institutions, ideologies, and embodiments of physical culture.
Credit Only Granted for: KNES613 or KNES689I.
Formerly: KNES689I.

KNES614 Cultural Studies and Physical Culture (3 Credits)
Discusses the political commitments, constituents, and complexities of cultural studies, and their relevance for furthering the understanding of physical culture and the project of physical cultural studies.
Credit Only Granted for: KNES614 or KNES689P.
Formerly: KNES689P.

KNES615 The Body, Culture, and Physical Activity (3 Credits)
Critically examines the social constitution and embodied experience of various empirical fields of physical culture, including sport, health, movement, exercise, recreation dance, and daily living related activities.

KNES616 Physical Cultural Studies (3 Credits)
Provides an introduction to the derivation, elements, focus, and future of the Physical Cultural Studies project, specifically related to the empirical, theoretical, methodological, and axiological aspects of Physical Cultural Studies.
Credit Only Granted for: KNES616 or KNES689B.
Formerly: KNES689B.

KNES618 Current Readings in Exercise and Applied Physiology (1 Credit)
Student-led presentations of contemporary literature in the areas of genetics, exercise science, fitness and health. Emphasis on papers describing new research findings, novel techniques, innovative methods, and emerging issues.
Prerequisite: KNES360; or students who have taken courses with comparable content may contact the department.
Repeatable to: 10 credits.

KNES619 Current Readings in Physical Cultural Studies (1 Credit)
Student led presentations of contemporary literature in physical cultural studies and related areas. Emphasis on material describing new empirical and/or theoretical insights, innovative methods, and emerging issues.
Repeatable to: 10 credits.
Credit Only Granted for: KNES609 or KNES619.
Additional Information: Priority enrollment for students in Kinesiology in the Physical Cultural Studies specialization area.

KNES621 Teaching Elementary Physical Education (3 Credits)
Students will learn aspects of teaching elementary physical education including: characteristics of elementary school students, testing, grading, teaching lifetime skills, and effective teaching techniques using SHAPE America Standards.
Restriction: Must be enrolled in Pre-K to 12 Physical Education Master of Education program.
Credit Only Granted for: KNES689V or KNES621.
Formerly: KNES689V.

KNES622 Teaching Secondary Physical Education (3 Credits)
Students will learn aspects of teaching secondary physical education including: characteristics of secondary school students, testing, grading, teaching lifetime activities, and effective teaching techniques using SHAPE America Standards.
Restriction: Must be enrolled in PreK-12 Physical Education Master of Education program.
Credit Only Granted for: KNES689I OR KNES622.
Formerly: KNES689I.

KNES628 PCS Research & Writing Workshop (3 Credits)
This directed and project focused writing workshop provides students in Physical Cultural Studies, and related fields, the opportunity to develop a processual understanding of the writing craft, focused on enhancing academic writing and editing skills, practices, and routines.
Repeatable to: 6 credits.
Credit Only Granted for: KNES628 or KNES789P.
Formerly: KNES789P.

KNES630 Sociology of Sport in Contemporary Perspective (3 Credits)
Studies social organization and the role of individuals and groups in sport situations: the interrelationship of sport with traditional social institutions; sport as a sub-system and its structure; and sport and social problems.

KNES643 Public Health & Physical Activity in the Classroom (3 Credits)
The purpose of the course is to engage students in developing curriculum that blends movement activity with courses such as math, science, social studies, literature, writing, art, and music to teach traditional classroom courses as an instrument of public health.
Recommended: KNES600.
Restriction: Must be in the Master of Public Health program; or permission of the Kinesiology Department.

KNES645 Exercise and Brain Health (3 Credits)
Examines the evidence for exercise to affect brain function and brain health in children, in adults, and in old age. Covers the adaptations to acute and chronic exercise within brain networks related to emotion, stress reactivity, memory, and executive function, and the effectiveness of physical activity and exercise as treatments for depression, anxiety disorders, and cognitive impairment.
Prerequisite: Minimum grade of C- in KNES350; or students who have taken courses with comparable content may contact the department.
Credit Only Granted for: KNES645 or KNES689X.
Formerly: KNES689X.

KNES651 Motor Control & Synergy (3 Credits)
Students will learn the history, concepts, theories, computations, and pathology regarding motor synergies of human movements.
Credit Only Granted for: KNES651 or KNES789P.
Formerly: KNES789P .

KNES658 Teaching Internship in Physical Education (1-6 Credits)
The MCERT PE internship is an intense experience that immerses interns into the life of their assigned Secondary school. The internship experience is designed to provide our pre-service teachers with a rich opportunity to learn the craft of teaching through close observation of experts as well as practice in the planning, delivery and assessment of instruction.
Restriction: Must be in the Pre-K to 12 Physical Education Master of Education program.
Repeatable to: 6 credits.
Credit Only Granted for: KNES658 or KNES689T.
Formerly: KNES689T.

KNES660 Psychology of Athletic Performances (3 Credits)
Psychological factors, mechanisms, and processes in athletic performance. The basic approach is social psychological, according to which the focus is on individual performance in the interpersonal athletic context. Intrapersonal and interpersonal factors and their effects on athletic performance. Psychology of peak performance, choking, and errors of mental control. Analysis of the general principles and types of mental training.
Prerequisite: KNES350.
Credit Only Granted for: KNES660 or KNES689Z.
Formerly: KNES689Z.

KNES662 Psychology of Exercise and Health (3 Credits)
Examines the antecedents and consequences of exerciese behavior. Explores motivation, attitude, control, socialization. Proposes intervention strategies at the individual, organizational and societal levels.
Prerequisite: KNES350; or students who have taken courses with comparable content may contact the department.
Credit Only Granted for: KNES662 or KNES689O.
Formerly: KNES689O.

KNES663 History of Sport in Western Culture (3 Credits)
The history of sport in the ancient, medieval and renaissance West.

KNES674 Quantitative Methods in Cognitive Motor Behavior (3 Credits)
Includes basic computer programming, algorithm, and quantitative techniques for time- series data with an emphasis on, but not limited to, human movement. These topics will be taught using MATLAB, a programming language and environment for numerical computation, data processing, analysis, and visualization.
Recommended: Proficiency in Precalculus and Linear Algebra or permission of department.
Credit Only Granted for: KNES689R or KNES674.
Formerly: KNES689R.

KNES676 Multisensory Perception and Human Motor Control (3 Credits)
Overview of the major sensory inputs to human motor control and spatial orientatin including auditory, somatosensory, visual and vestibular.

KNES678 Professional Seminar for Teacher Development in Physical Education (1-3 Credits)
The spring seminar course is an extension of the fall seminar course and spring internship course. It accompanies a full time undergraduate level teaching internship and is intended to support and extend students' field experience learning. The spring seminar course is designed to continue to provide students with the support they need to successfully meet the College of Education's Middle School Mathematics and Science programmatic requirements and the Maryland State Department of Education's Middle School Mathematics and Science Teacher Certification Requirements. These requirements include demonstrating mastery on all of the College of Education's Foundational Competencies (FCCs) and Performance Based Assessments (PBAs) and the national edTPA, InTASC, and AMLE Standards.
Restriction: By permission only for graduate students enrolled in the KNES MCERT program.
Repeatable to: 3 credits.

KNES689 Special Problems in Kinesiology (1-6 Credits)
Master or doctoral candidates who desire to pursue special research problems under the direction of their advisor may register for 1-6 hours of credit under this number.
Repeatable to: 60 credits.

KNES691 Muscular Aspects of Exercise Physiology (3 Credits)
Skeletal muscle structure and function including muscle development, excitation-contraction coupling, muscle fiber types and fatigue, muscle biochemistry, gene expression, muscle damage and regeneration. The effects of aging and exercise training on skeletal muscle.
Prerequisite: KNES360.
Recommended: BSCI422.

KNES692 Cardiovascular Aspects of Exercise Physiology (3 Credits)
A comprehensive consideration of the various cardiovascular factors affecting human physical performance. Emphasis on the regulation of cardiovascular functions during physical activity. Energy liberation and transfer, circulation, respiration, temperature regulation, physiology of work at altitudes, aerobic endurance training, and exercise, health and aging.
Prerequisite: KNES360.

KNES694 Metabolic Aspects of Exercise Physiology (3 Credits)
Effects of exercise on digestion, absorption, transport, storage, mobilization, and utilization of macronutrients. Emphasis on the effects of exercise training on energy metabolism.
Prerequisite: KNES360.
Recommended: BCHM462 and BCHM461.

KNES711 Professional Development and Grantsmanship (3 Credits)
Enhance continued professional development through an exploration of culture, climate, expectations and mentoring in research I universities. Generate a grant application including the hypothesis, structure, specific aims, background and significance, and submission of a total grant. Grant process and product will be emphasized.
Restriction: Must be a Doctoral student; and must be in a major in SPHL-School of Public Health.
Credit Only Granted for: KNES711 or KNES789X.
Formerly: KNES789X.

KNES751 Advanced Neuromechanics (3 Credits)
Covers the neurophysiological mechanisms relevant to the processes of generating voluntary movements. The course promotes independent thinking of students and enhances knowledge of basic facts about the design of cells, muscles, neuronal structures, and the whole body for the understanding of typical and atypical movement production related to the nervous system and the functioning brain.
Recommended: Undergraduate-level biomechanics and motor control or equivalents.
Credit Only Granted for: KNES751 or KNES789A.
Formerly: KNES789A.

KNES778 Practical Experience in Physical Activity and Public Health (1-4 Credits)
The practical experience is a time-limited, supervised period of public/community health activities carried out in a health or allied health organization involved with physical activity. Students gain practical experience in areas such as program planning and implementation, program evaluation, public policy analysis, research, and management.
Prerequisite: KNES600, KNES601, and KNES602.
Repeatable to: 4 credits.
Credit Only Granted for: KNES778 or KNES785.

KNES780 Preparation for Capstone Project in Physical Activity and Public Health (3 Credits)
Provides detailed preparation for the culminating experience in which the student applies knowledge and skills learned in the MPH program to conduct independent work on a physical activity problem under the supervision of a faculty advisor. Students will gain proficiency in conducting literature research and reviews, analyzing research methodology for appropriateness for their individual capstone projects, identifying gaps in the literature to support potential capstone topics, and preparing the capstone proposal presentation.
Recommended: Quantitative/Qualitative research methods course .
Restriction: Must be in the Master of Public Health program; or permission of the Kinesiology Department.
Additional Information: This course is also available for students in programs other than PHAO. Priority enrollment reserved for MPH in PA students.

KNES786 Capstone Project in Physical Activity and Public Health (3 Credits)
The culminating experience in which the student applies knowledge and skills learned in the MPH program to conduct independent work on a physical activity problem under the supervision of a faculty advisor.
Prerequisite: KNES600, KNES601, and KNES602.

KNES789 Advanced Projects in Kinesiology (1-3 Credits)
Advanced projects examining current problems and trends in kinesiology.
Repeatable to: 3 credits.

KNES798 Internship in Physical Education/Sports Management (1-8 Credits)
Practical application of previously acquired skills and knowledge in a sport and/or physical education setting. Emphasis on selected experiences to enhance the total academic program of the student. The internship site assignment will depend upon student's background and career goals.
Prerequisite: Permission of SPHL-Kinesiology department.
Repeatable to: 8 credits.

KNES799 Master's Thesis Research (1-6 Credits)

KNES898 Pre-Candidacy Research (1-8 Credits)

KNES899 Doctoral Dissertation Research (1-8 Credits)

KORA - Korean

KORA499 Independent Study Korean (1-3 Credits)
Independent study under faculty supervision.
Prerequisite: Permission of instructor.
Repeatable to: 6 credits if content differs.

LARC - Landscape Architecture

LARC411 Construction Technology I: Principles of Site Engineering (4 Credits)
First of three courses in the landscape architecture engineering and construction sequence that focuses on the principles, procedures, and applications of site grading. Included in this subject area are the topics of relief visualization and representation, slope and contour calculations, grading objectives and methodology, structure siting principles, drainage principles, contour manipulation procedures, stormwater management, horizontal and vertical road alignment, and cut-fill calculations.
Corequisite: LARC231 or LARC641.
Restriction: Must be in Landscape Architecture program.
Credit Only Granted for: LARC320, LARC411 or LARC720.
Formerly: LARC320.

LARC412 Construction Technology II: Materials and Structures (4 Credits)
Second of three courses in the landscape architecture engineering and construction sequence focuses on site construction, soil and water-centric Best Design Practices (BDPs). Included in this subject area are the topics of construction operations and earthwork, soil erosion and sediment control, retaining wall, soil and constructed media, shoreline construction, bioretention and planting systems and green roofs
Prerequisite: LARC411.
Corequisite: LARC330 or LARC642.
Restriction: Must be in Landscape Architecture program.
Credit Only Granted for: LARC321, LARC412 or LARC721.
Formerly: LARC321.

LARC413 Construction Technology III: Water Soil-Centric Practices (4 Credits)
Third of three courses in the landscape architecture engineering and construction sequence focuses on site construction, soil and water-centric Best Design Practices (BDPs). Included in this subject area are the topics of construction operations and earthwork, soil erosion and sediment control, retaining wall, soil and constructed media, shoreline construction, bioretention and planting systems and green roofs.
Prerequisite: LARC412.
Restriction: Must be in Landscape Architecture program.

LARC420 Professional Practice (3 Credits)
An introduction to and comparative study of the professional concerns of design firms. Focus on planning, legal, ethical, marketing and management considerations of interdisciplinary practices.
Prerequisite: LARC321.
Restriction: Must be in Landscape Architecture program.

LARC421 Computer-Aided Design and Drafting (CADD): Urban Construction (3 Credits)
This Computer-Aided Design and Drafting (CADD) course applies computer drafting using AutoCAD. It focuses on providing the technical skills for students who are working in built environment professions. Drawing types may include (but not be limited to) site plan drawings, construction detailing, grading plans, site layout plans and sheet layout conventions.
Credit Only Granted for: LARC489O or LARC421.
Formerly: LARC489O.

LARC430 Community Design Studio (5 Credits)
Studio that emphasizes the integration of critical thinking skills and methodologies introduced throughout the landscape architecture curriculum. Students apply design and analysis methodologies, evaluate alternative solutions, involve community residents and engage in final design development, using the master plan and site design process, report writing, and oral and graphic presentations. Final presentations are open to the university and the community.
Prerequisite: LARC331 and LARC413; and must have completed or be concurrently enrolled in LARC420.
Restriction: Senior standing; and must be in Landscape Architecture program.

LARC440 Urban Design Studio (5 Credits)
The landscape architect's role within the interdisciplinary urban design process, focusing on urban site design issues. Pedestrian friendly site design and the future of sustainable development will be studied.
Prerequisite: LARC321; and LARC340; and LARC341.
Restriction: Must be in Landscape Architecture program.

LARC451 Sustainable Communities (3 Credits)
Explores concepts, strategies and examples of community design which address the needs of a growing population while preserving the environment and its resources.

LARC452 Green Infrastructure and Community Greening (3 Credits)
A critical look and exploration of green infrastructure (GI) elements in the built environment in contributing to ecosystems services and the sustainability of the built environment. The course explores the science, issues, challenges, and the policy, planning and design solutions offered by green infrastructure.
Prerequisite: PLSC110 and PLSC111; or (PLSC112 and PLSC113); or permission of instructor.
Restriction: Junior standing or higher.
Credit Only Granted for: LARC489G or LARC452.
Formerly: LARC489G.

LARC453 Introduction to GIS and Hydrologic Modeling (3 Credits)
Introduction to Geographic Information Systems (GIS) and their application to hydrologic modeling. Basic GIS skills are used to manipulate and analyze spatial data to populate NRCS TR-55 hydrologic model for use in sizing constructed wetlands, bio-retention cells, and minor flood zones. No prior knowledge of GIS or hydrologic modeling is required. Stormwater and erosion control permitting as well as basic design principles for Maryland Environmental Site Design standards are introduced.

LARC454 Principles for Planting Design (3 Credits)
Emphasis will be placed on the analysis of natural systems of the landscape as they relate to visual thinking and to the rigor of the design process. Planting Design will familiarize you with native habitats, reinforce the application of design principles, and assess human response to the built environment in terms of developing a planting scheme. Students will acquire an understanding of and an appreciation for complex, interdependent relationships that exist in a healthy plant community. Students will graphically represent planting plans as communication tools suitable for client and contractor discussion as well as the basic construction documentation process through plant schedules, details, technical specifications, soil analysis, cost estimating, site preparation, and landscape maintenance procedures.
Prerequisite: PLSC253 or equivalent; and LARC220 or LARC620.
Restriction: Permission of Landscape Architecture program; and must be in Landscape Architecture program; or permission of Landscape Architecture program.
Credit Only Granted for: LARC454 or LARC489E.
Formerly: LARC489E.

LARC461 People and the Environment (3 Credits)
Focus is placed on human and environmental interactions. Students will look at both natural and built environments and how they influence human health and well-being. Many environmental settings will be examined. These include hospitals, public housing neighborhoods, school settings, retirement communities, transportation corridors and green spaces. We will also explore how racial and socio-economic factors affect living and working environmental conditions. Ultimately, students will be using this knowledge to create environments that support individuals, families and various community groups' health and well-being.
Credit Only Granted for: LARC489K or LARC461.
Formerly: LARC489K.

LARC470 Landscape Architecture Seminar (3 Credits)
A combination of self-directed study, seminar, and lecture formats. An introduction to aspects of research methods, critical analysis, and proposal writing with a focus on urban and community design.
Prerequisite: LARC321; and LARC341.
Corequisite: LARC440.
Restriction: Senior standing; and must be in Landscape Architecture program.

LARC471 Capstone Praxis Studio (5 Credits)
A capstone experience with projects of varied thematic content that emphasize the integration of critical thinking skills and methodologies introduced throughout the landscape architecture curriculum. Students apply design and analysis methodologies, evaluate alternative solutions, involve community residents and engage in final design development, using the master plan and site design process, report writing, and oral and graphic presentations. Final presentations are open to the university and the community.
Prerequisite: LARC430.
Restriction: Senior standing; and must be in Landscape Architecture program.

LARC489 Special Topics in Landscape Architecture (1-4 Credits)
Credit according to time scheduled and organization of course. A lecture and/or studio course organized as an in-depth study of a selected specialization of landscape architecture not covered by existing courses.
Prerequisite: Permission of AGNR-Plant Science & Landscape Architecture department.
Repeatable to: 4 credits if content differs.

LARC499 Independent Studies in Landscape Architecture (1-4 Credits)
Independent studies in landscape architecture including field, studio or library research under the direction of a faculty member.
Prerequisite: 12 credits in LARC courses; or permission of AGNR-Plant Science & Landscape Architecture department.
Restriction: Must be in Landscape Architecture program; or must be in Plant Sciences program.
Repeatable to: 4 credits if content differs.

LARC620 Graphic Tools for Landscape Representation (3 Credits)
This course integrates digital and analog methods of communication and provides an introduction to computer tools and techniques commonly used in landscape architecture practice. Non-drafting computer tools will be used to orient basic digital image capture, manipulation, and presentation formatting. Also includes techniques and application of various media for graphic communication associated with landscape architecture.
Corequisite: LARC640.
Restriction: Permission of AGNR-Plant Science & Landscape Architecture department.

LARC640 Graduate Studio I (5 Credits)
Principles and techniques of design as applied to shaping the landscape; developing concepts in visual thinking, environmental awareness, and design intervention through studio exercises and projects.
Corequisite: LARC620.
Restriction: Permission of AGNR-Plant Science & Landscape Architecture department.

LARC641 Graduate Studio II (5 Credits)
Principles and techniques of site analysis, environmental design and site development for human settlements and interaction with natural systems. Will expand analytical skills through complex site design problems. Students will research, observe and apply low impact development and sustainable practices, become familiar with building and landscape types by investigating alternative arrangements on the land, and understand user needs and design for populations with a range of abilities. Will support LEED and sustainable practices and acknowledge the requirements of public health, safety, and welfare.
Prerequisite: LARC640.
Corequisite: LARC720.
Restriction: Permission of AGNR-Plant Science & Landscape Architecture department.

LARC642 Graduate Studio III (5 Credits)
A focus on the interaction of landscape science (hydrology, geology, etc.) with the necessities and mechanisms of human settlements (transportation, economics, etc.) emphasizing innovative and forward thinking solutions to urbanization and ecological problems. It will apply this knowledge to landscape analysis, recreational planning and design, and community development, emphasizing resource management, spatial organization, landscape character, and the physical and social structure of community services. This course will be required for both Trach 1 and Track 2 students.
Prerequisite: LARC641.
Corequisite: LARC670.
Restriction: Permission of AGNR-Plant Science & Landscape Architecture department.

LARC648 Graduate Studio IV (5 Credits)
An exploration that will focus on issues in landscape planning and design such as campus planning, urban housing and recreation, and neighborhood preservation, restoration and development. Projects will emphasize the value of responsible academic and civic landscapes, the place of historic resources in contemporary life, and innovative solutions for the integration of past and future landscapes.
Prerequisite: LARC721 and LARC642.
Restriction: Permission of AGNR-Plant Science & Landscape Architecture department.
Repeatable to: 6 credits if content differs.

LARC661 Seminar in Landscape Architecture (1 Credit)
Explore the multifaceted realm of the profession and discipline for landscape architecture. Students will explore a select topic or technology for the intersection of nature, culture, and human intervention in shaping the built environment. Through critical readings or exercise, participants learn critical technologies, analyze historical precedents, contemporary theories, and design and planning practices. Engaging discussions and collaborative projects or exercise empower students to synthesize knowledge, fostering a holistic perspective.
Restriction: Must be in Landscape Architecture program .

LARC663 Landscape and Garden History (3 Credits)
History of garden making and its evolution into design practice. Students will become familiar with narratives of garden art and landscape architecture through the study of selected key sites, designers, and visual written sources. A focus on gardens' past and afterlife; the nature of primary sources (both built and written), and how these can be evaluated and used. Primary sources will be drawn from several disciplines and include a wide array of genres: treatises, epistolary exchanges, tax returns, novels, poems, paintings and drawings.
Restriction: Permission of AGNR-Plant Science & Landscape Architecture department.

LARC670 Landscape Architecture Theory and Criticism (3 Credits)
Review and analysis of the body of literature concerning landscape architecture and relationships between humans and both natural and designed environments. Topics may include: rationalism, ethics, aesthetics, social and economic values, postmodernism, feminist, multiculturalism, ecological determinism, preservation/conservation, and sustainability and ecological design. Each week students will lead a debate and discussion on a theoretical issue based on the assigned readings for that week.
Restriction: Permission of AGNR-Plant Science & Landscape Architecture department.

LARC671 Landscape Architecture Research Methods (3 Credits)
Investigation and discussion of broad scope of research methods and the development of landscape design and planning research techniques and skills. The urban environment will be viewed primarily as a social and psychological environment, with concern for who uses these environments and the conflicts that can arise between user groups.
Restriction: Permission of AGNR-Plant Science & Landscape Architecture department.

LARC689 Special Topics in Landscape Architecture (1-6 Credits)
Special topics in landscape architecture
Repeatable to: 6 credits if content differs.

LARC699 Independent Studies in Landscape and Architecture (1-3 Credits)
Individual Instruction course.
Restriction: Permission of instructor.
Repeatable to: 6 credits.

LARC720 Environmental Analysis and Site Engineering (3 Credits)
Techniques for prediction of alterations in social and natural processes brought about by human use of the land; application of such assessments to environmental management; basic methods of landscape alteration, augmentation, and control including grading, drainage, road and trail design, and stormwater management.
Prerequisite: LARC640; or permission of AGNR-Plant Science & Landscape Architecture department.
Corequisite: LARC641.

LARC721 Landscape Construction Methods and Materials (3 Credits)
Basic methods of constructing landscapes and manipulating the appropriate plant and inorganic materials for the creation of ecologically sustainable environments for human use. An examination of the use, properties, and detailing of materials used in landscape construction.
Prerequisite: LARC720.
Restriction: Permission of AGNR-Plant Science & Landscape Architecture department.

LARC748 Advanced Special Topics Studio (5 Credits)
Advanced special topics comprehensive landscape architecture studio-exploration will focus on cultural, behavioral and ecological issues in the physical planning and design of urban landscapes.
Prerequisite: LARC648 and LARC671.
Restriction: Permission of AGNR-Plant Science & Landscape Architecture department.
Repeatable to: 10 credits if content differs.

LARC799 Master's Thesis Research (1-6 Credits)
Development of a terminal thesis on a problem in landscape architecture, designed to demonstrate comprehensive skills and knowledge achieved in the graduate program. The subject will be selected in consultation with an advisor and periodically reviewed with a committee headed by the advisor.
Prerequisite: LARC748.
Restriction: Permission of AGNR-Plant Science & Landscape Architecture department.
Repeatable to: 12 credits if content differs.

LATN - Latin

LATN405 Lucretius (3 Credits)
Readings are in Latin.

LATN410 Latin Historians (3 Credits)
Latin historical writing as a literary genre. Influences, style, and literary techniques. Readings are in Latin.

LATN415 Vergil's Aeneid (3 Credits)
Vergil's Aeneid: readings of selections in Latin and of the entire epic in English translation along with critical essays.
Formerly: LATN305.

LATN472 Historical Development of the Latin Language (3 Credits)
An analysis of the development of the Latin language from archaic times to the Middle Ages.
Credit Only Granted for: LATN472 or LING431.

LATN488 Latin Readings (3 Credits)
The reading of one or more selected Latin authors from antiquity through the Renaissance. Reports.
Prerequisite: Permission of ARHU-Classics department.
Repeatable to: 6 credits if content differs.
Additional Information: Readings are in Latin.

LATN499 Independent Study in Latin Language and Literature (1-3 Credits)
Prerequisite: Permission of ARHU-Classics department.
Repeatable to: 6 credits if content differs.

LATN604 Cicero (3 Credits)
A study of Cicero's contributions to Roman literature and culture. Readings from the speeches, letters, and/or philosophical and rhetorical works. The development of Cicero's style, his philosophy, and his attitudes toward the changing political scene between 82 and 43 B.C.

LATN605 Vergil (3 Credits)
A study of Vergil's development as a literary artist and Augustan poet through readings in the Eclogues, Georgics, and Aeneid. Readings are in Latin.

LATN623 The Augustan Age (3 Credits)
Analysis of the major literary figures and genres in prose and poetry of the period from 43 BC to AD 14.

LATN630 Latin Literature of the Late Empire (3 Credits)
An examination of Latin literary texts from the third to the fifth centuries A.D., Christian as well as pagan.

LATN672 Historical Development of the Latin Language (3 Credits)
An analysis of the development of the Latin language from the archaic period to the Middle Ages.

LATN688 Special Topics in Latin Literature (3 Credits)
Repeatable to: 9 credits if content differs.

LATN699 Independent Studies in Latin Literature (1-3 Credits)
Prerequisite: Permission of ARHU-Classics department.
Repeatable to: 6 credits.

LATN799 Master's Thesis Research (1-6 Credits)

LBSC - Library Science

LBSC499 Workshops, Clinics, and Institutes (1-9 Credits)
Workshops, clinics, and institutes developed around specific topics or problems. Primarily for practicing librarians.
Repeatable to: 9 credits.

LBSC602 Serving Information Needs (3 Credits)
An introduction to the skills necessary to interact directly with individuals through the exploration of user behavior theory, strategies to locate and evaluate information from print and electronic resources, and policies and procedures to ensure that all individuals can become information literate.
Restriction: Must be enrolled in a graduate program in INFO; or permission of instructor.

LBSC611 History of the Book (3 Credits)
Introduction to the history and development of the book from pre-printing and incunabula to the post-modern book. Book illustration; publishing; collecting.
Restriction: Must be enrolled in a graduate program in INFO; or permission of instructor.

LBSC631 Achieving Organizational Excellence (3 Credits)
Overview of the principles, practices, and techniques required for effective leadership and management. The innovative strategies, management responsibilities, and skills needed to achieve and sustain high organizational performance in information-based cultural institutions.
Restriction: Must be enrolled in a graduate program in INFO; or permission of instructor.

LBSC641 Selecting and Evaluating of Resources for Learning (3 Credits)
Policies and procedures for collection development, including identifying, evaluating, acquiring, providing, and promoting resources in all formats, to support learning and teaching in elementary and secondary schools.
Restriction: Must be enrolled in a graduate program in INFO; or permission of instructor.

LBSC644 Collection Development (3 Credits)
Activities through which library collections are systematically developed and managed are explored, especially the formulation and implementation of written collection development policies. Other specific topics include identification of user needs; collection evaluation; fund allocation among competing departments, subjects, and/or media; selection methods; intellectual freedom; storage alternatives; and cooperative collection development.
Prerequisite: LBSC602.
Restriction: Must be enrolled in a graduate program in INFO; or permission of instructor.

LBSC645 Literature and Materials for Children (3 Credits)
Survey of literature and other materials for children and youth. Criteria for evaluating and using such materials as they relate to the needs, interests, reading abilities, and other capabilities of young readers.
Restriction: Must be enrolled in a graduate program in INFO; or permission of instructor.

LBSC646 Literature and Materials for Young Adults (3 Credits)
Survey of literature and other materials for older children and adolescents. Criteria for evaluating and using such materials as they relate to the needs, interests, reading abilities, and other capabilities of young readers.
Restriction: Must be enrolled in a graduate program in INFO; or permission of instructor.

LBSC671 The Lifecycle of Information (3 Credits)
Introduction to methods used to create, acquire, organize, manage and preserve information. Information systems currently used to support digital and physical libraries, databases, and repositories will be explored.
Restriction: Must be enrolled in a graduate program in INFO; or permission of instructor.

LBSC702 User Instruction (3 Credits)
Critical analysis of the rationale, content, and processes of user instruction in library and information settings.
Prerequisite: LBSC602; or permission of instructor.
Restriction: Permission of INFO-College of Information Studies.

LBSC703 Field Study in Archives and Digital Curation (3 Credits)
Supervised internship experience in archives or digital curation programs in organizations and institutions.
Prerequisite: LBSC602, LBSC631, and LBSC671; and must have completed 9 additional credits. Or permission of instructor.
Restriction: Must be in Library and Information Science (Master's) program; and permission of INFO-College of Information Studies.

LBSC706 Seminar in International and Comparative Librarianship and Information Science (3 Credits)
Comparison and contrast of bibliographic systems, institutions, service arrangements, and professional patterns in developed and developing cultures. Libraries, information organizations, and international information systems viewed against the backdrop of national cultures. Influences of social, political, and economic factors upon these forms.
Prerequisite: LBSC602; or permission of instructor.
Restriction: Permission of INFO-College of Information Studies.

LBSC707 Field Study in Information Service (3 Credits)
Supervised internship experience in a library, archive, museum, or other information organization.
Prerequisite: LBSC602, LBSC671, and LBSC631; and must have completed an additional 9 credits. Or permission of instructor.
Restriction: Must be in Library and Information Science (Master's) program; and permission of INFO-College of Information Studies.

LBSC708 Special Topics in Library and Information Science (1-3 Credits)
A special topics course with content determined by individual instructors. For questions about the content of the course contact the College of Information Studies.
Restriction: Must be enrolled in a graduate program in INFO; or permission of instructor.
Repeatable to: 9 credits if content differs.
Additional Information: No student may earn more than a total of 12 credits (combined) in LBSC 708 and LBSC 709.

LBSC709 Independent Study (1-3 Credits)
Intensive individual study, reading, or research in an area of specialized interest under faculty supervision.
Restriction: Must be enrolled in a graduate program in INFO; or permission of instructor.
Repeatable to: 9 credits.

LBSC713 Planning and Evaluating Library and Information Services (3 Credits)
An investigation of quantitative and qualitative methods used to plan and evaluate the effectiveness of library and information services. Planning and evaluation methodologies will be analyzed and critiqued. Selected methods will be demonstrated and/or utilized.
Prerequisite: LBSC602; or permission of instructor.
Restriction: Permission of INFO-College of Information Studies.

LBSC723 Advocacy and Support for Information Services (3 Credits)
Role and influence of government, foundations, associations, and other organizations in supporting and setting the agenda for information services of all types. Role of information professionals in demonstrating advocacy, fund-raising, public relations, lobbying, and seeking external support.
Restriction: Must be enrolled in a graduate program in INFO; or permission of instructor.

LBSC724 Public Library Seminar (3 Credits)
Organization, support, and service patterns of public libraries. The public library in national, state, and local contexts.
Prerequisite: Permission of INFO-College of Information Studies.

LBSC731 Special Collections (3 Credits)
Management of special collections, whose holdings may include manuscripts (particularly personal papers), non-textual materials, graphical materials, and rare books, with analysis of the custodial and management functions associated with special collections.
Prerequisite: LBSC602; or permission of instructor.
Restriction: Permission of INFO-College of Information Studies.

LBSC734 Seminar in the Academic Library (3 Credits)
Role of the academic library within the framework of higher education. Planning programs and services, collections, support, fiscal management, physical plant, and cooperation.
Prerequisite: LBSC602; or permission of instructor.
Restriction: Permission of INFO-College of Information Studies.

LBSC741 Seminar in School Library Administration (3 Credits)
Development, management, and evaluation of school library programs at all levels.
Prerequisite: INST650; or permission of instructor.
Restriction: Permission of INFO-College of Information Studies.

LBSC742 Collaborative Instructional Design and Evaluation (3 Credits)
School librarians' collaborative role in instruction. Systematic design, development, and evaluation of instructional strategies and products for learning.
Prerequisite: INST650; or permission of instructor.
Restriction: Permission of INFO-College of Information Studies.

LBSC745 Storytelling Materials and Techniques (3 Credits)
Literary sources and instruction and practice in oral techniques.
Restriction: Permission of INFO-College of Information Studies.

LBSC749 Internship in School Libraries (1-6 Credits)
Opportunities to observe and participate in the operation of school libraries at the elementary and secondary levels under the supervision of certified school librarians. Required of all School Library Media certification candidates.
Prerequisite: INST650, LBSC641, INST651, and LBSC741; or permission of instructor.
Restriction: Permission of instructor; and permission of INFO-College of Information Studies.
Repeatable to: 6 credits.
Credit Only Granted for: LBSC744 or LBSC749.
Formerly: LBSC744.

LBSC750 Research and Teaching Fellowship I (1 Credit)
Part of the Research and Teaching Fellowship program, a three-semester teacher training and professional development program in academic libraries. Fellows will complete weekly readings, participate in weekly discussions, observe information literacy instruction sessions, and co-teach at least one research session with another fellow.
Restriction: Must be enrolled in a graduate program in INFO; or permission of instructor.

LBSC751 Research and Teaching Fellowship II (1 Credit)
Part of the Research and Teaching Fellowship program, a three-semester teacher training and professional development program in academic libraries. Fellows will complete weekly readings, complete weekly teaching reflections, and begin preparations for the academic job search.
Restriction: Must be enrolled in a graduate program in INFO; or permission of instructor.

LBSC752 Research and Teaching Fellowship III (1 Credit)
Part of the Research and Teaching Fellowship program, a three-semester teacher training and professional development program in academic libraries. Fellows will complete weekly readings, participate in weekly discussions, and serve as a Discussion Leader for two class periods of LBS750, Research and Teaching Fellowship I. Taken in conjunction with the field study course, either LBSC 703 or LBSC 707.
Restriction: Must be enrolled in a graduate program in INFO; or permission of instructor.

LBSC770 Metadata and Tools for Information Professionals (3 Credits)
Principles, standards, and practices of information representation to facilitate accessing needed information in digital bibliographic environments. Includes exposure to Metadata, XML, RDA/AACR2R, DTDs, MARC, Dublin Core, MODS, ISBN and ISSN, FRBR, FRAD, Classification systems, and Controlled Vocabularies such as LCSH, SEARS, NLM, Getty and ERIC Thesauri, and others.
Prerequisite: LBSC671; or permission of instructor.
Restriction: Permission of INFO-College of Information Studies.

LBSC786 Library and Archives Preservation (3 Credits)
An introduction to library and archives materials and media, the risks that affect their preservation and strategies used to enhance preservation of library and archives collections. The course reviews preservation knowledge and skills that archival and library staff uses when providing access, managing, processing and working with collections.
Prerequisite: INST604; and permission of instructor.
Restriction: Permission of INFO-College of Information Studies.

LBSC791 Designing Principled Inquiry (3 Credits)
Critical analysis of roles of information professions and institutions in integrating theory, methods, practice, policies, and values of the field, and applying them to the design of future information systems and services.
Prerequisite: LBSC671, LBSC602, and LBSC631; and additional 9 credits of coursework applied to the MLIS degree. Or permission of instructor.
Restriction: Permission of INFO-College of Information Studies.

LBSC799 Master's Thesis Research (1-6 Credits)
Intensive research conducted under the supervision of a faculty member.
Prerequisite: INST701; and permission of instructor.
Restriction: Must be in Library and Information Science (Master's) program; and permission of instructor; and permission of INFO-College of Information Studies.
Repeatable to: 9 credits.

LGBT - Lesbian Gay Bisexual Transgender Studies

LGBT448 Special Topics in Lesbian, Gay, Bisexual, and Transgender Studies (3 Credits)
In-depth study of particular themes and issues in LGBT studies.
Prerequisite: LGBT200; or permission of LGBT Studies Program.
Restriction: Junior standing or higher.
Repeatable to: 9 credits if content differs.

LGBT448W Sex, Gender, and Jewish Identity (3 Credits)
An exploration of Jewish embodiment, including dynamics related to biological sex, culturally-framed gender, and sexuality. Topics of discussion may include transgender and intersex Jews, stereotypes and gender performance, modesty, genetics, and body alteration. Focus is on contemporary Jewish culture, framed within the larger historical and textual tradition.
Prerequisite: 1 course in WGSS; or 1 course in JWST; or 1 course in LGBT; or permission of instructor.
Cross-listed with: JWST492, WGSS492.
Credit Only Granted for: JWST492, JWST409G, LGBT448W, WMST498W or WGSS492.
Formerly: WMST498W and JWST409G.

LGBT459 Selected Topics in Sexuality and Literature (3 Credits)
Detailed study of sexuality as an aspect of literary and cultural expression.
Prerequisite: Must have completed two lower-level English courses, at least one in literature.
Repeatable to: 9 credits if content differs.

LGBT488 Seminar in Lesbian, Gay, Bisexual, and Transgender Studies (1-3 Credits)
Developments in theories and methods of LGBT Studies, with emphasis upon interaction between the humanities and the social sciences in the elaboration of this interdisciplinary area of scholarship.
Prerequisite: 9 credits in LGBT courses; and permission of LGBT Studies Program.
Recommended: LGBT200. And ENGL265; or CMLT291.
Repeatable to: 9 credits if content differs.
Formerly: CMLT498Y.

LGBT499 Independent Study (1-3 Credits)
Directed research and analysis in LGBT Studies on a topic selected by the student.
Prerequisite: LGBT200; and permission of LGBT Studies Program.
Restriction: Senior standing.
Repeatable to: 6 credits if content differs.

LING - Linguistics

LING410 Grammar and Meaning (3 Credits)
The basic notions of semantic theory: reference, quantification, scope relations, compositionality, thematic relations, tense and time, etc. The role these notions play in grammars of natural languages. Properties of logical form and relationship with syntax.
Prerequisite: Permission of instructor; or LING311.

LING419 Topics in Syntax (3 Credits)
Topics vary.
Prerequisite: LING311.
Repeatable to: 12 credits if content differs.

LING420 Word Formation (3 Credits)
Examination of shape and meaning of possible words, both across languages and within particular languages. Interaction between principles of word formation and other components of a grammar: syntax, logical form and phonology.
Prerequisite: LING321 and LING311.

LING429 Topics in Phonology (3 Credits)
Advanced seminar in phonology. Topics vary.
Prerequisite: LING322.
Repeatable to: 6 credits if content differs.

LING439 Topics in Diachronic Linguistics (3 Credits)
Repeatable to: 6 credits if content differs.

LING440 Grammars and Cognition (3 Credits)
Relationship between the structure, development and functioning of grammars and the structure, development and functioning of other mental systems. Interpretations of experimental and observational work on children's language, aphasia, speech production and comprehension.
Prerequisite: LING321 and LING311.

LING444 Child Language Acquisition (3 Credits)
Examines language acquisition in infancy and early childhood: the nature of children's linguistic representations and how these develop naturally. Role of (possible) innate linguistic structure and interaction of such structure with experience. Evaluation of methods and results of current and classic research leading to contemporary models of language development.
Prerequisite: LING311.

LING448 Advanced Laboratory Research in Linguistics (2-3 Credits)
Individualized, collaborative research course aimed at developing skills for laboratory research in language acquisition, sentence processing or neurolinguistics. Conducting a research project in laboratory linguistics as part of a team creating original research relevant to current issues in linguistics.
Prerequisite: LING248; and (LING200 or LING240).
Restriction: Permission of instructor.
Repeatable to: 6 credits if content differs.
Additional Information: This course is part of a two-semester sequence. Ling248 is a prerequisite. Ling248 and Ling448 must be completed in the same laboratory.

LING449 Topics in Psycholinguistics (3 Credits)
Critical evaluation of primary research in psycholinguistics. Relating theoretical hypotheses to experimental hypotheses and predictions. Evaluation of experimental results. Emphasis on hands-on experience and experimental methodologies. Specific topics vary.
Prerequisite: LING321 and LING311; or permission of ARHU-Linguistics department.
Repeatable to: 6 credits if content differs.

LING451 Grammars and Variation (3 Credits)
Grammars and the use of language in a variety of styles: formal, casual, literary, etc. Consequences for concepts of grammars. Variation theory. Literary styles.
Prerequisite: LING311.

LING460 Diversity and Unity in Human Languages (3 Credits)
Fundamentals of grammatical typology as they relate to issues in social attitudes towards language. Linguistic structure of standard and non-standard languages and dialects. Relationship of different writing systems to linguistic structure. Issues in bilingualism and multilingualism.
Prerequisite: LING240 or LING200.

LING499 Directed Studies in Linguistics (1-3 Credits)
Independent study or research on language under the supervision of a faculty member.
Prerequisite: Permission of ARHU-Linguistics department.
Repeatable to: 6 credits if content differs.

LING610 Syntactic Theory (3 Credits)
Intensive introduction to transformational syntax.
Prerequisite: LING312.

LING611 Issues in Syntax (3 Credits)
Topics of current theoretical interest examined through data from a variety of languages.
Prerequisite: LING610.

LING620 Phonological Theory (3 Credits)
Topics in current phonological theory, as they relate to data from various languages. Segmental and prosodic analysis. Autosegmental theory, metrical theory, etc.
Prerequisite: LING322.

LING621 Issues in Phonology (3 Credits)
Topics of current interest in phonological theory examined through data from several languages.
Prerequisite: LING620.

LING625 Morphology and the Lexicon (3 Credits)
The structure of words and investigation of how word formation processes interact with other components of grammar.

LING640 Psycholinguistics (3 Credits)
Core graduate course in psycholinguistics, covering leading theoretical approaches and experimental methods in language acquisition, language processing, and neurolinguistics.
Restriction: Permission of instructor.

LING641 Issues in Psycholinguistics (3 Credits)
Topics of current interest in psycholinguistics, including both theoretical approaches and experimental and analytical issues in language acquisition, language processing, and neurolinguistics.
Prerequisite: LING640.

LING644 Language Acquisition (3 Credits)
Interpretations of observational and experimental work on children's language development, and relationship between developmental stages and theories of human language faculties.
Prerequisite: LING640.

LING646 Cognitive Neuroscience of Language (3 Credits)
Overview of classical and recent work on the neural basis of speech and language, with a goal of introducing contemporary methods and results to prepare the student to read the neurolinguistics and cognitive neuroscience literature. An emphasis will be placed on current techniques.

LING658 History of a Language (3 Credits)
Detailed examination of the history of a single language or language family.
Repeatable to: 6 credits if content differs.

LING659 Structure of a Language (3 Credits)
Detailed examination of a particular language or language family.
Repeatable to: 6 credits if content differs.

LING660 Introduction to Semantics (3 Credits)
Basic concepts and methods of contemporary semantic theory including basic set theory, elementary propositional and predicate calculus, the structure of predicates and propositions, quantification binding. Prepares students for study of more advanced topics in semantics.
Restriction: Permission of instructor.

LING661 Issues in Semantics (3 Credits)
A second course in semantic theory. Application of basic concepts and methods to topics of current theoretical interest.
Prerequisite: LING660; or permission of ARHU-Linguistics department.

LING663 Pragmatics (3 Credits)
An intensive introduction to formal linguistic pragmatics: the study of systematic dependencies of meaning on context of use. Topics will include implicature, presupposition, reference, topic, focus, and the linguistic means of expressing these.
Prerequisite: LING660 or PHIL660; or permission of instructor.
Recommended: LING661.

LING678 Linguistic Field Methods (3 Credits)
A hands-on introduction to conducting linguistic analysis on an unfamiliar language. Students work with a native speaker of a language that they are not familiar with, devising elicitations and developing analyses. Investigations will include phonological, morphological, syntactic, and semantic properties of the language.
Prerequisite: Minimum grade of B- in LING311 and LING321.
Restriction: Permission of instructor.
Repeatable to: 6 credits if content differs.

LING689 Independent Study (1-3 Credits)
Independent studies in grammatical theory.
Restriction: Permission of instructor; and must be in a major within ARHU-Linguistics department.
Repeatable to: 6 credits if content differs.

LING698 Directed Study (1-3 Credits)
Repeatable to: 6 credits if content differs.

LING723 Natural Language Processing (3 Credits)
Introduce fundamental concepts, techniques, and algorithms for the computational handling of natural language. Statistical and machine learning techniques, models, and algorithms that enable computers to deal with the ambiguity and implicit structure of human language. Approaches that focus on uncovering linguistic structure, such as syntactic or semantic parsing, as well as those that focus on manipulating text in useful ways, such as question answering or machine translation.
Prerequisite: Minimum grade of C- in CMSC422; and permission of CMNS-Computer Science department.
Cross-listed with: CMSC723, INST735.
Credit Only Granted for: CMSC723, LING723, or INST735.
Additional Information: CMSC students may only receive PhD Comp. credit for CMSC723 or CMSC823, not both.

LING773 Computational Linguistics II (3 Credits)
Natural language processing with a focus on corpus-based statistical techniques. Topics include: stochastic language modeling, smoothing, noisy channel models, probabilistic grammars and parsing; lexical acquisition, similarity-based methods, word sense disambiguation, statistical methods in NLP applications; system evaluation.
Prerequisite: LING723, CMSC723, or INST735; or permission of instructor. Cross-listed with CMSC773, INST736.
Credit Only Granted for: CMSC773, LING773, or INST736.
Additional Information: CMSC students may only receive PhD Comp. credit for CMSC723 or CMSC823, not both.

LING798 Research Papers in Linguistics (1-6 Credits)
Prerequisite: LING611 and LING621.
Repeatable to: 6 credits if content differs.

LING799 Master's Thesis Research (1-6 Credits)

LING819 Seminar in Syntactic Theory (3 Credits)
Current topics in research on syntactic theory.
Prerequisite: LING611.
Repeatable to: 6 credits if content differs.

LING829 Seminar in Phonological Theory (3 Credits)
Current topics in research on phonology and morphology.
Prerequisite: LING621.
Repeatable to: 6 credits if content differs.

LING839 Seminar in Language Change (3 Credits)
Topics in research on historical change in language.
Prerequisite: LING630.
Repeatable to: 6 credits if content differs.

LING848 Seminar in Computational Linguistics (3 Credits)
Current topics in research in computational linguistics.
Prerequisite: LING645; or permission of instructor.

LING849 Seminar in Psycholinguistics (3 Credits)
Current topics in research on psycholinguistics.
Prerequisite: LING640 or LING641; or permission of instructor.
Repeatable to: 6 credits if content differs.

LING859 Seminar in Language Acquisition (3 Credits)
Current topics in research on language acquisition.
Prerequisite: LING640 or LING641; or permission of ARHU-Linguistics department.
Repeatable to: 6 credits if content differs.
Credit Only Granted for: LING859 or LING889A.
Formerly: LING889A.

LING869 Seminar in Neurolinguistics (3 Credits)
Current topics in research on neurolinguistics.
Prerequisite: LING640 or LING641; or permission of ARHU-Linguistics department.
Repeatable to: 6 credits if content differs.
Credit Only Granted for: LING869 or LING889A.
Formerly: LING889A.

LING879 Seminar in Semantics (3 Credits)
Current topics in research in semantics.
Prerequisite: LING660 or LING661.
Repeatable to: 9 credits if content differs.
Formerly: LING889.

LING888 Doctoral Research Paper (1-6 Credits)
Students will strengthen their abilities to formulate coherent research questions, conduct research and create a publishable piece of work. In addition, the course is part of a set of requirements to advance to doctoral candidacy.
Repeatable to: 6 credits.
Credit Only Granted for: LING888 or LING895.
Formerly: LING895.

LING889 Directed Research (1-8 Credits)

LING896 Research Paper in Minor Area (3 Credits)
This course is designed to strengthen the students' ability to do research in a minor area of expertise, and to help them create a publishable piece. In addition, the course constitutes part of a set of requirements to advance to doctoral candidacy.
Prerequisite: LING888.

LING898 Pre-Candidacy Research (1-8 Credits)

LING899 Doctoral Dissertation Research (1-8 Credits)

MAIT - Masters in the Mathematics of Advanced Industrial Tech

MAIT626 Statistical Pattern Recognition and Classification (3 Credits)
Mathematical and statistical tools for decision making based on categorization of patterns present in data. Topics include regression, feature extraction, dimensionality reduction, parametric and non-parametric approaches to decision, estimation, and classification problems.

MAIT679 Special Topics in Mathematics of Advanced Industrial Technology (3 Credits)
Special topics courses are intended to expose students to the latest developments in mathematical applications. As such, the content will vary depending on the instructor and the current state-of-the-art. 679 will appear with a letter appended to distinguish different topics. New 679 courses will be added as areas of interest arise.

MAIT699 Independent Masters Project (1-3 Credits)
This course allows students to apply advanced mathematical methods to practical, real-world problems. Projects are supervised individually by faculty members from the MAIT Program. The project's nature is flexible and determined jointly by the student and supervisor. A detailed final report must be prepared by the student and approved by the supervisor.
Restriction: Permission of instructor.
Repeatable to: 12 credits if content differs.

MATH - Mathematics

MATH401 Applications of Linear Algebra (3 Credits)
Various applications of linear algebra: theory of finite games, linear programming, matrix methods as applied to finite Markov chains, random walk, incidence matrices, graphs and directed graphs, networks and transportation problems.
Prerequisite: 1 course with a minimum grade of C- from (MATH461, MATH240, MATH341).

MATH402 Algebraic Structures (3 Credits)
For students having only limited experience with rigorous mathematical proofs. Parallels MATH403. Students planning graduate work in mathematics should take MATH403. Groups, rings, integral domains and fields, detailed study of several groups; properties of integers and polynomials. Emphasis is on the origin of the mathematical ideas studied and the logical structure of the subject.
Prerequisite: 1 course with a minimum grade of C- from (MATH240, MATH341, MATH461).
Restriction: Must not be in any of the following programs (Mathematics (Master's); Mathematics (Doctoral)).
Credit Only Granted for: MATH402 or MATH403.

MATH403 Introduction to Abstract Algebra (3 Credits)
Integers; groups, rings, integral domains, fields.
Prerequisite: 1 course with a minimum grade of C- from (MATH405 or MATH410).
Credit Only Granted for: MATH402 or MATH403.

MATH404 Field Theory (3 Credits)
Algebraic and transcendental elements, Galois theory, constructions with straight-edge and compass, solutions of equations of low degrees, insolubility of the quintic equation, Sylow theorems, fundamental theorem of finite Abelian groups.
Prerequisite: Minimum grade of C- in MATH403.

MATH405 Linear Algebra (3 Credits)
An abstract treatment of finite dimensional vector spaces. Linear transformations and their invariants.
Prerequisite: 1 course with a minimum grade of C- from (MATH240, MATH461, MATH341); and minimum grade of C- in MATH310.

MATH406 Introduction to Number Theory (3 Credits)
Integers, divisibility, prime numbers, unique factorization, congruences, quadratic reciprocity, Diophantine equations and arithmetic functions.
Prerequisite: 1 course with a minimum grade of C- from (MATH240, MATH241, MATH246, MATH340, MATH341, MATH461, MATH243, ENEE290); or permission of CMNS-Mathematics department.

MATH410 Advanced Calculus I (3 Credits)
Subjects covered: sequences and series of numbers, continuity and differentiability of real-valued functions of one variable, the Riemann integral, sequences of functions and power series.
Prerequisite: 1 course with a minimum grade of C- from (MATH240, MATH461, MATH341); and 1 course with a minimum grade of C- from (MATH340, MATH241); and minimum grade of C- in MATH310; and permission of CMNS-Mathematics department.

MATH411 Advanced Calculus II (3 Credits)
Continuation of MATH410. Topics include: The topology of sets in Rn, the derivative matrix, the general chain rule, inverse and implicit function theorems with applications, smooth curves and surfaces in R3, Lagrange multipliers. Additional topics may include: Metric spaces, the contraction principle, the existence and uniqueness theorem for nonlinear first order differential equations, the Riemann integral of Rn, introduction to integration on curves and surfaces, Green's theorem.
Prerequisite: Minimum grade of C- in MATH410.

MATH416 Applied Harmonic Analysis: An Introduction to Signal Processing (3 Credits)
Introduces students to the mathematical concepts arising in signal analysis from the applied harmonic analysis point of view. Topics include applied linear algebra, Fourier series, discrete Fourier transform, Fourier transform, Shannon Sampling Theorem, wavelet bases, multiresolution analysis, and discrete wavelet transform.
Prerequisite: Minimum grade of C- in MATH141; and 1 course with a minimum grade of C- from (MATH240, MATH461, MATH341); and familiarity with MATLAB is required.

MATH420 Mathematical Modeling (3 Credits)
The course will develop skills in data-driven mathematical modeling through individual and group projects. Emphasis will be placed on both analytical and computational methods, and on effective oral and written presentation of results.
Prerequisite: 1 course with a minimum grade of C- from (MATH240, MATH461, MATH341, ENEE290, MATH243); and 1 course with a minimum grade of C- from (MATH241, MATH340); and 1 course with a minimum grade of C- from (MATH246, MATH341, ENEE290, MATH243); and 1 course with a minimum grade of C- from (STAT400, STAT410); and 1 course with a minimum grade C- from (CMSC106, CMSC131).
Recommended: AMSC460 or AMSC466.
Cross-listed with: AMSC420.
Credit Only Granted for: AMSC420 or MATH420.

MATH423 Linear Optimization (3 Credits)
Mathematical formulation of linear programming, graphical solutions, simplex method, duality, transportation problems, assignment problems, and game theory.
Prerequisite: 1 course with a minimum grade of C- from (MATH240, MATH401, MATH461, or MATH341).
Credit Only Granted for: MATH423 or MATH498T.
Formerly: MATH498T.

MATH424 Introduction to the Mathematics of Finance (3 Credits)
Introduction to the mathematical models used in finance and economics with emphasis on pricing derivative instruments. Designed for students in mathematics, computer science, engineering, finance and physics. Financial markets and instruments; elements from basic probability theory; interest rates and present value analysis; normal distribution of stock returns; option pricing; arbitrage pricing theory; the multiperiod binomial model; the Black-Scholes option pricing formula; proof of the Black-Scholes option pricing formula and applications; trading and hedging of options; Delta hedging; utility functions and portfolio theory; elementary stochastic calculus; Ito's Lemma; the Black-Scholes equation and its conversion to the heat equation.
Prerequisite: Minimum grade of C- in MATH141; and 1 course with a minimum grade of C- from (STAT400, STAT410); and permission of CMNS-Mathematics department.
Recommended: MATH246, MATH240, MATH241, MATH340, or MATH341.
Credit Only Granted for: BMGT444, MATH424.

MATH430 Euclidean and Non-Euclidean Geometries (3 Credits)
Hilbert's axioms for Euclidean geometry. Neutral geometry: the consistency of the hyperbolic parallel postulate and the inconsistency of the elliptic parallel postulate with neutral geometry. Models of hyperbolic geometry. Existence and properties of isometries.
Prerequisite: 1 course with a minimum grade of C- from (MATH240, MATH341, MATH461).

MATH431 Geometry for Computer Applications (3 Credits)
Topics from projective geometry and transformation geometry, emphasizing the two-dimensional representation of three-dimensional objects and objects moving about in the plane and space. The emphasis will be on formulas and algorithms of immediate use in computer graphics.
Prerequisite: 1 course with a minimum grade of C- from (MATH461, MATH240, MATH341).

MATH432 Introduction to Topology (3 Credits)
Metric spaces, topological spaces, connectedness, compactness (including Heine-Borel and Bolzano-Weierstrass theorems), Cantor sets, continuous maps and homeomorphisms, fundamental group (homotopy, covering spaces, the fundamental theorem of algebra, Brouwer fixed point theorem), surfaces (e.g., Euler characteristic, the index of a vector field, hairy sphere theorem), elements of combinatorial topology (graphs and trees, planarity, coloring problems).
Prerequisite: Minimum grade of C- in MATH410.

MATH436 Differential Geometry of Curves and Surfaces I (3 Credits)
Curves in the plane and Euclidean space, moving frames, surfaces in Euclidean space, orientability of surfaces; Gaussian and mean curvatures; surfaces of revolution, ruled surfaces, minimal surfaces, special curves on surfaces, "Theorema Egregium"; the intrinsic geometry of surfaces.
Prerequisite: 1 course with a minimum grade of C- from (MATH241, MATH340); and 1 course with a minimum grade of C- from (MATH461, MATH240, MATH341); and must have completed two 400-level MATH courses with a minimum grade of C- (not including MATH461, and 480's).

MATH437 Differential Forms (3 Credits)
Introduction to differential forms and their applications, and unites the fundamental theorems of multivariable calculus in a general Stokes Theorem that is valid in great generality. It develops this theory and technique to perform calculations in analysis and geometry. Topics include an introduction to topological spaces, the Gauss-Bonnet Theorem, Gauss's formula for the linking number, and the Cauchy Integral Theorem. Applications include Maxwell's equations of electromagnetism, connections and gauge theory, and symplectic geometry and Hamiltonian dynamics.
Prerequisite: 1 course with a minimum grade of C- from (MATH241, MATH340); and 1 course with a minimum grade of C- from (MATH240, MATH341, MATH461).
Recommended: MATH405, MATH403, MATH436, MATH410, or MATH432.

MATH440 Geometry and Data Science of Sports Analytics (3 Credits)
Students will learn as well as gain hands-on experience in geometrical aspects and data analysis aspects of sports performance analytics. The course will involve programming via Python as well as other software. Topics may include JSON, using API to gather and analyze big data sets arising in sports analytics, detecting geometrical patterns in data, analyzing motion tracking data. Interactions between mathematics, statistics, hands-on programming and geometry of data sets will be emphasized.
Prerequisite: MATH240, MATH341 or MATH461.
Recommended: Python programming experience.
Credit Only Granted for: MATH498R or MATH440.
Formerly: MATH498R.

MATH445 Elementary Mathematical Logic (3 Credits)
Elementary development of propositional and predicate logic, including semantics and deductive systems and with a discussion of completeness, incompleteness and the decision problem.
Prerequisite: Minimum grade of C- in MATH141.

MATH446 Axiomatic Set Theory (3 Credits)
Development of a system of axiomatic set theory, choice principles, induction principles, ordinal arithmetic including discussion of cancellation laws, divisibility, canonical expansions, cardinal arithmetic including connections with the axiom of choice, Hartog's theorem, Konig's theorem, properties of regular, singular and inaccessible cardinals.
Prerequisite: 1 course with a minimum grade of C- from (MATH403, MATH410).

MATH452 Introduction to Dynamics and Chaos (3 Credits)
An introduction to mathematical dynamics and chaos. Orbits, bifurcations, Cantor sets and horseshoes, symbolic dynamics, fractal dimension, notions of stability, flows and chaos. Includes motivation and historical perspectives, as well as examples of fundamental maps studied in dynamics and applications of dynamics.
Prerequisite: MATH341; or MATH246 and one of (MATH240 or MATH461).
Cross-listed with: AMSC452.
Credit Only Granted for: AMSC452 or MATH452.

MATH456 Cryptography (3 Credits)
The theory, application, and implementation of mathematical techniques used to secure modern communications. Topics include symmetric and public-key encryption, message integrity, hash functions, block-cipher design and analysis, number theory, and digital signatures.
Prerequisite: (CMSC106, CMSC131, or ENEE150; or equivalent programming experience); and (2 courses from (CMSC330, CMSC351, ENEE324, or ENEE382); or any one of these courses and a 400-level MATH course, or two 400-level MATH courses); and Permission of CMNS-Mathematics department or permission of instructor.
Cross-listed with: CMSC456, ENEE456.
Credit Only Granted for: MATH456, CMSC456 or ENEE456.

MATH461 Linear Algebra for Scientists and Engineers (3 Credits)
Basic concepts of linear algebra. This course is similar to MATH240, but with more extensive coverage of the topics needed in applied linear algebra: change of basis, complex eigenvalues, diagonalization, the Jordan canonical form.
Prerequisite: Minimum grade of C- in MATH141.
Credit Only Granted for: MATH240, MATH341, or MATH461.
Additional Information: This course may not be used towards the upper level math requirements for MATH/STAT majors.

MATH462 Partial Differential Equations (3 Credits)
Linear spaces and operators, orthogonality, Sturm-Liouville problems and eigenfunction expansions for ordinary differential equations. Introduction to partial differential equations, including the heat equation, wave equation and Laplace's equation. Boundary value problems, initial value problems and initial-boundary value problems.
Prerequisite: 1 course with a minimum grade of C- from (MATH241, MATH340); and 1 course with a minimum grade of C- from (MATH246, MATH341, ENEE290, MATH243).

MATH463 Complex Variables (3 Credits)
The algebra of complex numbers, analytic functions, mapping properties of the elementary functions. Cauchy integral formula. Theory of residues and application to evaluation of integrals. Conformal mapping.
Prerequisite: 1 course with a minimum grade of C- from (MATH241, MATH340).

MATH464 Transform Methods (3 Credits)
Fourier transform, Fourier series, discrete fast Fourier transform (DFT and FFT). Laplace transform. Poisson summations, and sampling. Optional Topics: Distributions and operational calculus, PDEs, Wavelet transform, Radon transform and applications such as Imaging, Speech Processing, PDEs of Mathematical Physics, Communications, Inverse Problems.
Prerequisite: 1 course with a minimum grade of C- from (MATH246, MATH341, ENEE290, MATH243).

MATH470 Mathematics for Secondary Education (3 Credits)
An advanced perspective on some of the core mathematics underlying high school mathematics courses. Topics include number systems, functions of one variable, equations, inequalities, trigonometric functions, curve fitting, and polynomials. The course includes an analysis of alternate approaches to mathematical ideas and problems, and makes connections between ideas that may have been studied separately in different high school and college courses.
Prerequisite: MATH141 and MATH140; and must have completed one 400-level MATH course (not to include MATH461, 478, and 480's).
Restriction: Must be in the Secondary Math Education major.

MATH475 Combinatorics and Graph Theory (3 Credits)
General enumeration methods, difference equations, generating functions. Elements of graph theory, matrix representations of graphs, applications of graph theory to transport networks, matching theory and graphical algorithms.
Prerequisite: 1 course with a minimum grade of C- from (MATH240, MATH341, MATH461, ENEE290, MATH243); and 1 course with a minimum grade of C- from (MATH241, MATH340); and 1 course with a minimum grade of C- from (MATH310, CMSC250).
Cross-listed with: CMSC475.
Credit Only Granted for: MATH475 or CMSC475.

MATH478 Selected Topics For Teachers of Mathematics (1-3 Credits)
Prerequisite: Permission of CMNS-Mathematics department.
Additional Information: Math majors may not use this course to fulfill the upper-level math requirement.

MATH480 Algebra for Middle School Teachers (3 Credits)
Prepares teachers with elementary certification to teach Algebra 1 in middle school. Focuses on basic algebra concepts and related theoretical ideas.
Prerequisite: MATH214.
Restriction: Must be a middle school teacher; and permission of CMNS-Mathematics department.
Credit Only Granted for: MATH480 or MATH483.
Additional Information: Not applicable to MATH/STAT major or minor requirements.

MATH481 Statistics and Data Analysis for Middle School Teachers (3 Credits)
Prepares teachers with elementary certification to teach simple data analysis and probability in middle school. Focuses on understanding basic statistics, data analysis, and related theoretical ideas.
Prerequisite: MATH214.
Restriction: Must be a middle school teacher; and permission of CMNS-Mathematics department.
Credit Only Granted for: MATH481 or MATH485.
Additional Information: Not applicable to MATH/STAT major or minor requirements.

MATH484 Geometry for High School Teachers (3 Credits)
Focuses on concepts related to geometry, including several geometry axiom schemes, transformations, and similarity. Includes constructions with Geometer's Sketchpad.
Prerequisite: MATH141; or students who have taken courses with comparable content may contact the department.
Restriction: Senior standing.
Credit Only Granted for: MATH482, MATH484, or MATH498E.
Formerly: MATH498E.

MATH487 Number for Middle Grades Teachers (3 Credits)
The rational number and proportional reasoning concepts developed in the middle grades and the larger mathematical context for these. Multiple representations of relationships, including verbal descriptions, diagrams, tables, graphs, and equations. Common misconceptions.
Prerequisite: Must have admission to M.A. or M.Ed. with concentration in Mathematics Education; or permission of CMNS-Mathematics department.
Restriction: This course may not be used towards the upper level math requirements for the MATH/STAT major.
Credit Only Granted for: MATH487 or MATH498K.
Formerly: MATH498K.

MATH489 Research Interactions in Mathematics (1-3 Credits)
Students participate in a vertically integrated (undergraduate, graduate and/or postdoctoral, faculty) mathematics research group. Format varies. Students and supervising faculty will agree to a contract which must be approved by the department. Up to three credits of MATH489 may be applied to the mathematics degree requirements. See the department's MATH489 online syllabus for further information.
Prerequisite: Permission of CMNS-Mathematics department.
Repeatable to: 10 credits if content differs.

MATH498 Selected Topics in Mathematics (1-9 Credits)
Topics of special interest to advanced undergraduate students will be offered occasionally under the general guidance of the departmental committee on undergraduate studies.
Repeatable to: 9 credits if content differs.

MATH600 Abstract Algebra I (3 Credits)
Groups with operators, homomorphism and isomorphism theorems, normal series, Sylow theorems, free groups, Abelian groups, rings, integral domains, fields, modules. Topics may include HOM (A,B), Tensor products, exterior algebra.
Prerequisite: MATH405 and MATH403; or students who have taken courses with comparable content may contact the department.

MATH601 Abstract Algebra II (3 Credits)
Field theory, Galois theory, multilinear algebra. Further topics from: Dedekind domains, Noetherian domains, rings with minimum condition, homological algebra.
Prerequisite: MATH600.

MATH602 Homological Algebra (3 Credits)
Projective and injective modules, homological dimensions, derived functors, spectral sequence of a composite functor. Applications.
Prerequisite: MATH600.

MATH603 Commutative Algebra (3 Credits)
Ideal theory of Noetherian rings, valuations, localizations, complete local rings, Dedekind domains.
Prerequisite: MATH600.

MATH606 Algebraic Geometry I (3 Credits)
Prime and primary ideals in Noetherian rings, Hilbert Nullstellensatz, places and valuations, prevarieties (in the sense of Serre), dimension, morphisms, singularities, varieties, schemes, rationality.
Prerequisite: MATH600 and MATH601.

MATH607 Algebraic Geometry II (3 Credits)
Topics in contemporary algebraic geometry chosen from among: theory of algebraic curves and surfaces, elliptic curves, Abelian varieties, theory of schemes, theory of zeta functions, formal cohomology, algebraic groups, reduction theory.
Prerequisite: MATH606.

MATH610 Stochastic Calculus (3 Credits)
A course on Brownian motion and stochastic calculus. Topics include Gaussian processes and Brownian motion; continuous martingales and semimartingales; stochastic integration, Ito's formula, and Girsanov's theorem; connections between Brownian motion and partial differential equations; forward and backward Kolmogorov equations; stochastic differential equations; and local time.
Recommended: STAT600 and STAT601.
Cross-listed with: STAT610.
Credit Only Granted for: MATH610 or STAT610.

MATH620 Algebraic Number Theory I (3 Credits)
Algebraic numbers and algebraic integers, algebraic number fields of finite degree, ideals and units, fundamental theorem of algebraic number theory, theory of residue classes, Minkowski's theorem on linear forms, class numbers, Dirichlet's theorem on units, relative algebraic number fields, decomposition group, inertia group and ramification group of prime ideals with respect to a relatively Galois extension.
Prerequisite: MATH601.

MATH621 Algebraic Number Theory II (3 Credits)
Valuation of a field, algebraic function fields, completion of a valuation field, ramification exponent and residue class degree, ramification theory, elements, differents, discriminants, product formula and characterization of fields by the formula, Gauss sum, class number formula of cyclotomic fields.
Prerequisite: MATH600. And MATH620; or students who have taken courses with comparable content may contact the department.

MATH630 Real Analysis I (3 Credits)
Lebesgue measure and the Lebesgue integral on R, differentiation of functions of bounded variation, absolute continuity and fundamental theorem of calculus, Lp spaces on R, Riesz-Fischer theorem, bounded linear functionals on Lp, measure and outer measure, Fubini's theorem.
Prerequisite: MATH411; or students who have taken courses with comparable content may contact the department.

MATH631 Real Analysis II (3 Credits)
Abstract measure and integration theory, metric spaces, Baire category theorem and uniform boundedness principle, Radon-Nikodym theorem, Riesz Representation theorem, Lebesgue decomposition, Banach and Hilbert Spaces, Banach-Steinhaus theorem, topological spaces, Arzela-Ascoli and Stone-Weierstrass theorems, compact sets and Tychonoff's theorem.
Prerequisite: MATH630.

MATH632 Functional Analysis (3 Credits)
Introduction to functional analysis and operator theory: normed linear spaces, basic principles of functional analysis, bounded linear operators on Hilbert spaces, spectral theory of selfadjoint operators, applications to differential and integral equations, additional topics as time permits.
Prerequisite: MATH631.

MATH634 Harmonic Analysis (3 Credits)
L1 theory: Fejer theorem, inversion theorem, ideal structure, Tauberian theorem. L2 theory: Plancherel-Parseval theorems, Paley-Wiener theorem. Lp theory: Hausdorff-Young theorem. Distribution theory: Bochner's theorem, Wiener continuous measures theorem, Malliavin theorem, Schwartz theory, almost periodic functions.
Prerequisite: MATH630.

MATH636 Representation Theory (3 Credits)
Introduction to representation theory of Lie groups and Lie algebras; initiation into non-abelian harmonic analysis through a detailed study of the most basic examples, such as unitary and orthogonal groups, the Heisenberg group, Euclidean motion groups, the special linear group. Additional topics from the theory of nilpotent Lie groups, semisimple Lie groups, p-adic groups or C-algebras.
Prerequisite: MATH631.

MATH642 Dynamical Systems I (3 Credits)
Foundations of topological dynamics, homeomorphisms, flows, periodic and recurrent points, transitivity and minimality, symbolic dynamics. Elements of ergodic theory, invariant measures and sets, ergodicity, ergodic theorems, mixing, spectral theory, flows and sections. Applications of dynamical systems to number theory, the Weyl theorem, the distribution of values of polynomials, Vander Waerden's theorem on arithmetic progressions.
Prerequisite: MATH432. And MATH630; or students who have taken courses with comparable content may contact the department.

MATH643 Dynamical Systems II (3 Credits)
Entropy theory, variational principle for the entropy, expansiveness, measures with maximal entropy. Smooth systems on manifolds, diffeomorphisms and flows, periodic points, stable and unstable manifolds, homoclinic points, transversality, the Krupka-Smale theorem, Morse-Smale systems. Hyperbolicity, Anosov systems, distributions and foliations, strange attractors, Bowen's measure.
Prerequisite: MATH642; or students who have taken courses with comparable content may contact the department.

MATH660 Complex Analysis I (3 Credits)
Linear transformations, analytic functions, conformal mappings, Cauchy's theorem and applications, power series, partial fractions and factorization, elementary Riemann surfaces, Riemann's mapping theorem.
Prerequisite: MATH410 and MATH463; or students who have taken courses with comparable content may contact the department.

MATH661 Complex Analysis II (3 Credits)
Introduction to techniques of several complex variables, with focus on geometric topics: Hartogs phenomena, Cousin problems, Dolbeault cohomology, L2 techniques, embedding of Stein manifolds, and the theory of coherent analytic sheaves.
Prerequisite: MATH630 and MATH660.

MATH669 Selected Topics in Riemann Surfaces (1-3 Credits)
Construction of Riemann surfaces, hyperbolic geometry, Fuchsian and Kleinian groups, potential theory, uniformisation spaces of meromorphic functions, line bundles, Picard variety, Riemann-Roch, Teichmueller theory.
Restriction: Permission of instructor.
Repeatable to: 99 credits if content differs.

MATH670 Ordinary Differential Equations I (3 Credits)
Existence and uniqueness, linear systems usually with Floquet theory for periodic systems, linearization and stability, planar systems usually with Poincare-Bendixson theorem.
Prerequisite: MATH405.
Cross-listed with: AMSC670.
Credit Only Granted for: AMSC670 or MATH670.

MATH671 Ordinary Differential Equations II (3 Credits)
The content of this course varies with the interests of the instructor and the class. Stability theory, control, time delay systems, Hamiltonian systems, bifurcation theory, and boundary value problems.
Prerequisite: MATH630.
Cross-listed with: AMSC671.
Credit Only Granted for: AMSC671 or MATH671.

MATH673 Partial Differential Equations I (3 Credits)
Analysis of boundary value problems for Laplace's equation, initial value problems for the heat and wave equations. Fundamental solutions, maximum principles, energy methods. First order nonlinear PDE, conservation laws. Characteristics, shock formation, weak solutions. Distributions, Fourier transform.
Prerequisite: MATH411; or students who have taken courses with comparable content may contact the department.
Cross-listed with: AMSC673.
Credit Only Granted for: AMSC673 or MATH673.

MATH674 Partial Differential Equations II (3 Credits)
Boundary value problems for elliptic partial differential equations via operator-theoretic methods. Hilbert spaces of functions. Duality, weak convergence. Sobolev spaces. Spectral theory of compact operators. Eigenfunction expansions.
Prerequisite: MATH673 or AMSC673; or permission of instructor.
Cross-listed with: AMSC674.
Credit Only Granted for: AMSC674 or MATH674.

MATH675 Analysis and PDEs (3 Credits)
Introduction to tools of modern analysis which have been used in recent years in the study of partial differential equations: Fourier transform, Calderon-Zygmund theory, interpolation, Lebesgue spaces, Lorentz spaces, Sobolev spaces, Besov spaces, Littlewood-Paley theory, multipliers, Bernstein inequalities, the fractional Leibniz rule, Strichartz estimates, velocity averaging lemma. Applications to some of the following PDEs: the Navier-Stokes equations, Euler equations, nonlinear Schrodinger equations, nonlinear wave equations, the Patlak Keller Segel model.
Prerequisite: MATH630 or MATH674; or permission of instructor.

MATH689 Research Interactions in Mathematics (1-3 Credits)
The students participate in a vertically integrated (undergraduate, graduate and/or postdoctoral, faculty) research group. Format varies, but includes regular meetings, readings and presentations of material. See graduate program's online syllabus or contact the graduate program director for more information.
Restriction: Permission of instructor.
Repeatable to: 6 credits if content differs.

MATH695 Teaching Seminar (1 Credit)
A course intended for first year teaching assistants. Topics include: everyday mechanics of teaching; teaching methods and styles; technology; course enrichment, diversity in the classroom; sexual harassment; teacher-student interactions; presentations by students.
Restriction: Must be in one of the following programs (Mathematics (Doctoral); Mathematics (Master's); Mathematical Statistics (Doctoral); Applied Mathematics and Scientific Computation (Master's); Mathematical Statistics (Master's); Applied Mathematics and Scientific Computation (Doctoral)).

MATH712 Mathematical Logic I (3 Credits)
Sentential logic, first-order languages, models and formal deductions. Basic model theory including completeness and compactness theorems, other methods of constructing models, and applications such as non-standard analysis.

MATH713 Mathematical Logic II (3 Credits)
Incompleteness and undecidability results of Godel, Church, Tarski and others. Recursive function. Basic proof theory and axiomatic set theory.
Prerequisite: MATH712.

MATH721 Mathematical Population Biology (3 Credits)
Foundational principles for modeling and analysis of real-life phenomena in population biology. Topics include design and analysis of models for general classes of unstructured (single species discrete-time and continuous-time, interacting populations etc.) and structured (spatially-structured, age- structured, sex-structured) population biology models in ecology and epidemiology, dynamics analysis of population biology models (asymptotic stability and bifurcation theory), numerical discretization of continuous-time models, statistical analysis (parameter estimation, uncertainty quantification).
Prerequisite: Calculus, differential equations, modeling, linear algebra, familiarity with mathematical software and programming languages (e.g., MATLAB, R, Python etc.); or permission of instructor.
Cross-listed with: AMSC721.
Credit Only Granted for: AMSC721, BIOL721 or MATH721.
Additional Information: Open to advanced undergraduates by permission of instructor.

MATH730 Algebraic Topology I (3 Credits)
Fundamental group, covering spaces, simplicial and singular homology, CW complexes and cellular homology, cohomology and the universal coefficient theorem.
Additional Information: Students must have prior coursework similar to the content offered in undergraduate courses MATH403 and MATH432.

MATH734 Algebraic Topology II (3 Credits)
Cup products, Poincare duality, Kunneth formula, Whitehead and Hurewicz theorems, cellular approximation, Eilenberg-MacLane spaces, spectral sequences.
Prerequisite: MATH600 and MATH730.

MATH740 Fundamental Concepts of Differential Geometry (3 Credits)
Manifolds, tangent vectors and differential forms, Riemannian metrics, connections, curvature, structure equations, geodesics, calculus of variations.
Prerequisite: MATH405, MATH411, and MATH730; or students who have taken courses with comparable content may contact the department.

MATH742 Geometric Analysis (3 Credits)
Calculus of Variations, Bochner technique, Morse theory, weak solutions and elliptic regularity, maximum principle for elliptic and parabolic equations, Green's function of the Laplacian, isoperimetric and Sobolev inequalities, continuity method, curvature and comparison results, harmonic maps, curvature prescription problems.
Prerequisite: MATH673 and MATH674; or MATH740.

MATH744 Lie Groups I (3 Credits)
An introduction to the fundamentals of Lie groups, including some material on groups of matrices and Lie algebras.
Prerequisite: MATH405, MATH403, MATH411, and MATH432; or students who have taken courses with comparable content may contact the department.

MATH799 Master's Thesis Research (1-6 Credits)

MATH808 Selected Topics in Algebra (1-3 Credits)
Advanced topics of current interest.
Restriction: Permission of instructor.
Repeatable to: 18 credits.

MATH818 Selected Topics in Logic (1-3 Credits)
Advanced topics of current interest.
Restriction: Permission of instructor.
Repeatable to: 18 credits.

MATH838 Select Topics in Dynamics (1-3 Credits)
Advanced topics of current interest.
Repeatable to: 18 credits.

MATH848 Selected Topics in Geometry and Topology (1-3 Credits)
Advanced topics of current interest.
Restriction: Permission of instructor.
Repeatable to: 18 credits.

MATH858 Selected Topics in Analysis (1-3 Credits)
Advanced topics of current interest.
Restriction: Permission of instructor.
Repeatable to: 18 credits.

MATH868 SelectedTopics in Complex Analysis (1-3 Credits)
Advanced topics of current interest.
Restriction: Permission of instructor.
Repeatable to: 18 credits.

MATH898 Pre-Candidacy Research (1-8 Credits)

MATH899 Doctoral Dissertation Research (1-8 Credits)

MEES - Marine-Estuarine-Environmental Sciences

MEES412 Applied Bayesian Statistics (2 Credits)
This seminar will explore the practices of Bayesian network and graphical model to high dimensional inter-disciplinary environmental data. Through hands-on experience and real studies from Bayesian perspectives, students will learn the basics of evaluating Bayesian network and graphical analyses, and interpreting and communicating the results. Case studies involving ecological and environmental science will be used to illustrate Bayesian analyses. The statistical programming language R and software packages such as OpenBUGS, JAGS, and STAN will be used in illustrating Bayesian models.
Jointly offered with: MEES612.
Credit Only Granted for: MEES608R, MEES612, or MEES412.

MEES432 Physiological Ecology of Animals (3 Credits)
An examination of the influence of environmental constrains on animal function and energetic efficiency in the context of abiotic conditions in the habitats occupied by individuals.
Prerequisite: BSCI361; or students who have taken courses with comparable content may contact the department; or permission of instructor.
Credit Only Granted for: MEES498E, MEES698E, MEES432, or MEES632.
Formerly: MEES498E.

MEES484 Marine Microbial Ecology (3 Credits)
The primary goal of this course is to become familiar with the diversity, ecology, and biogeochemical roles of Bacteria, Archaea, microbial Eukaryotes, viruses, and fungi in the marine environment. The course will also cover the latest discoveries in molecular microbial ecology. Each main topic will begin with a lecture and will be followed by a paper discussion. For the paper discussions, each student will present selected papers specified in the syllabus (or by consensus with the course instructors). Students will also participate in class discussions.
Jointly offered with: MEES684.
Credit Only Granted for: MEES484 or MEES684.

MEES498 Topics in Marine-Estuarine-Environmental Sciences (1-4 Credits)
Lecture and/or laboratory series organized to study a selected area of marine-estuarine-environmental sciences not otherwise considered in formal courses.

MEES601 Applied Environmental Science (2 Credits)
Designed to promote an appreciation of interdisciplinarity in natural and social sciences and to provide exposure to how science can influence and inform ongoing policy and management debates. The course addresses the role of science and scientists in providing information to policy makers and managers on complex environmental challenges.
Credit Only Granted for: MEES601 or MEES609A.
Formerly: MEES609A.

MEES602 R Programming Basics (1 Credit)
R Programming- Part 1 Module (Basics)
Credit Only Granted for: MEES708X or MEES602.
Formerly: MEES708X.

MEES603 Responsible Conduct of Research (1 Credit)
Explores the "rules of the road" for being a scientist. Using a case study approach, the seminar will cover concepts of how science is regulated, what constitutes misconduct, how research is planned, conducted, and reported authorship and data ownership, and the ethical treatment of human and animal subjects. The course will focus mainly on mentor-trainee interactions and diversity in the sciences.
Credit Only Granted for: MEES608B or MEES603.
Formerly: MEES608B.

MEES604 Biometry (3 Credits)
Application of inferential statics to environmental data, design a sound experiments and studies, and a working knowledge of R.
Credit Only Granted for: BIOM601, MEES604, MEES698B.
Formerly: MEES698B.

MEES605 Energy and Environment (3 Credits)
Role of energy in environmental and human-dominated systems and their linkage. Discussion of the historical and modern production and consumption of energy. Energy systems simulation modeling, energy analysis and energy auditing. Review of national energy policies and proposed alternatives.
Prerequisite: MATH120; or must have completed MATH220; or students who have taken courses with comparable content may contact the department. Cross-listed with ENST605.
Credit Only Granted for: ENST405, ENST605, MEES605, or MEES698Z.
Formerly: MEES698Z.

MEES607 Quantitative Methods in Environmental Sciences (3 Credits)
Introduction to mathematical approaches and solutions (both analytical and numerical) that cut across environmental disciplines. Also introduces the Matlab programming language.
Restriction: Permission of the Marine-Estuarine Environmental Sciences program.

MEES608 Seminar in Marine-Estuarine-Environmental Sciences (1-2 Credits)

MEES609 Professional Development in Marine Estuarine Environmental Science (1-3 Credits)
Training designed for existing and future careers.
Repeatable to: 20 credits if content differs.

MEES611 Estuarine Systems Ecology (3 Credits)
A broad systems perspective on the important components and processes of estuarine ecosystems, with quantitative and/or mathematical treatment toward development of representative models for estuarine dynamics.

MEES612 Applied Bayesian Statistics (2 Credits)
This seminar will explore the advanced practices of Bayesian network and graphical model to high dimensional inter-disciplinary environmental data. Through hands-on experience and real studies from Bayesian perspectives, students will learn the basics of evaluating Bayesian network and graphical analyses, and interpreting and communicating the results. Case studies involving ecological and environmental science will be used to illustrate Bayesian analyses. The statistical programming language R and software packages such as OpenBUGS, JAGS, and STAN will be used in illustrating Bayesian models.
Recommended: MEES 698B or equivalent course, students are encouraged to discuss with the instructor.
Credit Only Granted for: MEES412, MEES608R or MEES612.
Formerly: MEES608R.

MEES613 Environmental Statistics I (3 Credits)
Extends the quantitative training for students in the environmental sciences. It will explore the basic practices of statistics to inter-disciplinary environmental data. The goal is to train students with the statistical knowledge and tools needed to conduct statistical analysis in their own research. The statistical programming language R is used in class, to complete homework sets, and to analyze online data.
Credit Only Granted for: MEES698B or MEES613.
Formerly: MEES698B.

MEES614 Spatial Ecology in R (3 Credits)
Many ecological questions in terrestrial and marine systems originate from the observation that organisms and the ecological processes that influence them vary in space. This course emphasizes the study of spatial ecological patterns (including animal movement), the processes that generate and maintain these patterns and processes, and the construction of models in R to analyze, simulate, and understand the interplay between spatial pattern, ecological processes, and scale. The objective of the course is to introduce students to ecological theories and concepts relevant to the study of spatial ecological patterns in terrestrial and marine systems, while providing the R skills necessary to articulate and answer scientific questions by confronting models with data.
Prerequisite: General Ecology and basic proficiency in R programming.
Recommended: Courses in GIS and statistics.
Restriction: Permission of instructor.

MEES615 Scientific Writing and Communication (2 Credits)
This professional development course will provide graduate students with a solid foundation in the fundamental concepts of scientific writing and communication to both scientists and citizens. Main topics will include the peer-review process and paper structure, how to develop strong editing and review skills, and how to craft effective research and outreach talks. Additional topics will include scientific ethics and application of communication skills to proposals, networking, job applications, and interviews. Students must agree to write new text for each writing assignment.
Restriction: Must have completed first year of graduate study; or permission of the instructor; and must have permission of the Marine Estuarine Environmental Sciences (MEES) Program.
Credit Only Granted for: MEES608D or MEES615.
Formerly: MEES608D.
Additional Information: Offered synchronously to all MEES partner institutions via video. Please contact the instructor(s) for access and logistical information as needed.

MEES617 Hydrological Effects of Land Use Change (3 Credits)
Detailed examination of the catchment-scale hydrological effects attributable to major land use and land cover alterations, including both anthropic and non-anthropic disturbances.
Prerequisite: Statistics course and hydrology course or permission of instructor.

MEES618 Seminars in Marine Estuarine Environmental Sciences (1-2 Credits)
Topics of interest in Marine Estuarine Environmental Sciences.
Repeatable to: 20 credits if content differs.

MEES620 Environment and Society (3 Credits)
Students will obtain foundational knowledge of core theories and methods that integrate cultural and socio-economic research into environmental science. Key topics include: coupled natural and human systems, cultural models of the environment, social networks, ecological economics, political ecology, environmental justice, and science communication.
Cross-listed with: ANTH620.
Credit Only Granted for: ANTH620 or MEES620.
Additional Information: Offered over the interactive video network.

MEES621 Biological Oceanography (4 Credits)
Population and community ecology of estuarine and marine systems; coastal and estuarine processes are emphasized in the context of oceans in general. Field and lab trips required.

MEES622 Sustainability Science: quantitative and systems approach (3 Credits)
Modern sustainability science goes beyond single-resource management and integrates biophysical and socio-economic considerations of sustainability. This course is designed to help provide students with a historical background, critical thinking approaches, and analytical tools to address sustainability from a scientific perspective.

MEES623 Comparative Animal Physiology (2 Credits)
Introduces students to the many biochemical and physiological mechanisms that allow different species to inhabit a variety of ecosystems.
Recommended: Undergraduate Biochemistry or Physiology.
Jointly offered with: MEES423.

MEES627 Biogeochemistry (3 Credits)
A detailed examination of Earth's biogeochemical cycles, with an emphasis on major elements and carbon cycling through globally important biomes. Topics include biogeochemical cycles of organic carbon and nutrients in terrestrial, lacustrine, wetland, and marine systems.
Credit Only Granted for: MEES627 or MEES698K (Spring 2023).
Formerly: MEES698K.

MEES631 Fish Ecology (3 Credits)
Study of the interrelationships between individuals, their communities and environment. Explores the environmental biology of fish, feeding ecology, energetics and growth, population biology, reproduction and life history, and population and community interactions.
Restriction: Permission of instructor.

MEES632 Physiological Ecology of Animals (3 Credits)
An examination of the influence of environmental constrains on animal function and energetic efficiency in the context of abiotic conditions in the habitats occupied by individuals.
Credit Only Granted for: MEES698E, MEES498E, MEES432, MEES632.
Formerly: MEES698E.

MEES637 Zooplankton Ecology (3 Credits)
A quantitative investigation of zooplankton ecology, emphasizing population dynamics and modeling, feeding, behavior, food-webs, and bio-physical interactions.
Prerequisite: MEES621; or permission of instructor.
Credit Only Granted for: MEES698G, MEES637.
Formerly: MEES698G.

MEES640 Interconnected Earth Systems: Land, Ocean, and Estuary (3 Credits)
Explores the interconnected physical and biogeochemical systems of land, estuary, and ocean with cross cutting themes of human impacts and global change. Broad concepts will be combined with targeted interactive case studies to demonstrate how these systems are linked by humans, climate, and water.

MEES650 Advanced Wetland Ecology (3 Credits)
Plant and animal communities, biogeochemistry, and ecosystem properties of wetlands. Lectures are supplemented by field trips (normally 2 days total during the semester) and in-class labs. Hands-on activities and exercises include identification of wetland plant species, wetland mapping and delineation, and collection and analysis of field data on wetland vegetation, soil, and hydrology. Wading boots (at least hip length) are strongly recommended.
Prerequisite: BIOM301; and ENST360 or other ecology equivalent; or permission of AGNR-Environmental Science and Technology department; or permission of CMNS-Marine & Estuarine-Environmental Science Program).
Cross-listed with: ENST650.
Jointly offered with: ENST450, MEES650.
Credit Only Granted for: ENST450, ENST650, or MEES650.
Additional Information: Wading boots (at least hip length) are strongly recommended.

MEES660 Ecological Systems (3 Credits)
An introduction to the field of ecology is provided for matriculating graduate students and prepares them for more advanced concepts. Students will be exposed to ecology both in theory and practice through lectures, readings, and quantitative exercises, round table debates and discussions with current practitioners.

MEES661 Physics of Estuarine and Marine Environments (3 Credits)
General introduction to the physical oceanography of estuarine and marine systems. Physical characteristics of seawater, heat and mass transport, major ocean currents, basic dynamical oceanography, surface waves, tides, turbulence, sediment transport, estuarine circulation.
Prerequisite: Must have completed one year of physics coursework; and must have completed one year of calculus coursework. Or permission of instructor.

MEES663 Ecological Genomics (3 Credits)
Next-generation sequencing has revolutionized ecology and evolutionary biology enabling genome-wide studies of genetic diversity and gene expression to understand how species adapt to current environments and respond to global change. In multi-species contexts, we now have the tools to understand the importance of interspecific gene flow in adaptation, determine the role of genetic diversity in community composition, and characterize the diversity and function of cryptic organisms, such as microbes, in communities and ecosystems. This course covers key topics in ecological genomics at the individual, population, interspecific, community and ecosystem levels. The course consists of lectures, student-led discussions of primary literature on genomic applications to contemporary environmental problems, and hands-on experience manipulating and analyzing real genomic data sets with the latest bioinformatic tools in UNIX/Linux and R.

MEES671 Remote Sensing for Environmental Management (4 Credits)
Coverage of tools necessary to carry out remote sensing studies of ecosystem pattern and process, land-use and land-cover change and the impact of climate changes. General overview of recent research at the interface of remote sensing, ecosystem analysis, global change, and environmental management.
Credit Only Granted for: MEES671, MEES698X.
Formerly: MEES698X.

MEES680 Cell and Molecular Biology for the Environmental Scientist-From Genes to Ecosystems (3 Credits)
Introduces environmental scientists to the methods and approaches that are the foundations for today's breakthroughs in molecular and cellular biology. Detailed examination of papers published in the last few years along with online background materials will be used to reinforce the connection of key concepts to experimentation.

MEES681 Advanced Ecological Design (3 Credits)
An advanced survey course on the field of ecological design. Principles of design are illustrated with case studies from biologically-based waste treatment systems, ecosystem management and sustainable development.
Prerequisite: Must have completed one semester of calculus; and (CHEM131 and PHYS121). Or permission of instructor. Cross-listed with E NST681.
Credit Only Granted for: ENST481, ENST681, or MEES681.

MEES682 Fishery Science and Management (3 Credits)
Aquatic production and fisheries yields. Introduction to fish population dynamics and assessment methods. Effects of fishing on resource potential yields. Causes of fluctuations in resource abundance. An emphasis on the relationship between science and management.
Restriction: Permission of instructor.

MEES684 Marine Microbial Ecology (3 Credits)
The primary goal of this course is to become familiar with the diversity, ecology, and biogeochemical roles of Bacteria, Archaea, microbial Eukaryotes, viruses, and fungi in the marine environment. The course will also cover the latest discoveries in molecular microbial ecology. Each main topic will begin with a lecture and will be followed by a paper discussion. For the paper discussions, each student will present selected papers specified in the syllabus (or by consensus with the course instructors). Students will also participate in class discussions.

MEES687 Next Generation Sequence and Analysis (2 Credits)
Provides a general background to sequence analysis and then move through a series of student-directed tutorials, mostly on the command line, working with datasets for the final thesis. Students who do not have data will be provided with comparable sequence files to gain fluency. The goal is to provide students with hands-on experience with Next-Generation sequence datasets and tailor the instruction to further enhance research.
Credit Only Granted for: MEES618C or MEES687.
Formerly: MEES618C.
Additional Information: Offered synchronously to all MEES partner institutions via video. Please contact the instructor(s) for access and logistical information as needed.

MEES698 Special Topics in Marine-Estuarine-Environmental Sciences (1-4 Credits)
Credit according to time schedule and course organization. Lecture and/or laboratory series organized to study selected areas of environmental science not otherwise considered by existing courses. May be repeated for credit since topic coverage will change.

MEES699 Special Problems in Marine-Estuarine-Environmental Sciences (1-3 Credits)
Research on specialized topics under the direction of individual faculty members.

MEES708 Advanced Topics in Marine-Estuarine-Environmental Science (1-4 Credits)
Lectures, experimental courses and other specialized graduate training in various relevant disciplines.
Repeatable to: 12 credits if content differs.

MEES712 Advanced Population Dynamics and Assessment (4 Credits)
Quantitative and modeling skills, including understanding of population dynamics and responses of populations to exploitation and management actions. Coverage of population models of production, mortality, stock and recruitment, age and growth, and harvesting, and methods for using these models to provide management advice.
Prerequisite: MEES607 or BIOM601; or permission of instructor.
Credit Only Granted for: MEES698D or MEES712.
Formerly: MEES698D.

MEES713 Environmental Statistics II (3 Credits)
Students will extend statistical training to advanced topics of time series analysis and spatial statistics. After taking this course, students will be familiar with a variety of state-of-the-art approaches for qualitative analysis of time- and space-dependent data. Students will become competent users of these methods by practicing them in class and in their homework assignments using the statistical programming language R.
Credit Only Granted for: MEES708M or MEES713.
Formerly: MEES708M.
Additional Information: Offered synchronously to all MEES partner institutions. Please contact the instructor(s) for access and logistical information as needed.

MEES718 Study Groups on Issues in Marine Estuarine Enviornmental Sciences (1-2 Credits)
Active discussions on current environmental topics and issues. Efforts may result in manuscripts, technical report or innovative communication products.
Prerequisite: MEES601 or MEES609A; or permission of the advising committee and instructor.
Repeatable to: 6 credits if content differs.

MEES753 Sediment Dynamics in Coastal and Estuarine Environments (3 Credits)
Focuses on sediment dynamics along the land-sea continuum, from intertidal to nearshore regions. The first part of the course develops relevant sediment-transport theories and equations used in the second part to examine coastal landscapes and features, including sediment/vegetation interactions. Integration of field observations and modeling approaches will be emphasized throughout the course, as will human impacts and responses to climate change.
Prerequisite: MEES640 or MEES660; or permission of instructor.
Credit Only Granted for: MEES698G or MEES753.
Formerly: MEES698G.
Additional Information: Offered synchronously to all MEES partner institutions. Please contact the instructor(s) for access and logistical information as needed.

MEES799 Masters Thesis Research (1-6 Credits)

MEES898 Pre-Candidacy Research (1-8 Credits)

MEES899 Doctoral Dissertation Research (1-8 Credits)

MIEH - Maryland Institute for Applied Environmental Health

MIEH407 One Health: Food Safety and Security (3 Credits)
This is a collaborative course with the University of Maryland and Cairo University, Cairo, Egypt to explore the One Health Foundation and its application to improving international food safety and security. The purpose of this global undergraduate class is to disseminate knowledge on One Health and its application to improving global food safety and security. Students will apply principles of One Health to ensure food safety and food security in Egypt.
Jointly offered with: MIEH607.
Restriction: Must have earned at least 75 credits .
Credit Only Granted for: MIEH607 or MIEH407.

MIEH480 Introduction to Occupational Health (3 Credits)
Through in-person site visits, hands-on activities and case studies, students will learn about healthy workplaces and their critical role in public health. The course will center on the field of occupational health and safety. Site visits will enable students to hear firsthand from workers, local health & safety professionals, and former students now in the field. Case studies will allow students to explore today's critical work hazards across various work environments and industries.Students will develop and apply essential skills, such as conducting a safety walk-through in a worksite, leading a worker safety training, and writing a safety plan for an employer. Upon course completion, students will be prepared to address traditional workplace problems, as well as emerging hazards like extreme heat, poor indoor air quality, and the mental health challenges of today's workplace.
Prerequisite: Minimum grade of C- in MIEH300 and EPIB301.
Recommended: BSCI201.

MIEH600 Foundations of Environmental Health (3 Credits)
Overview of the chemical, physical and biological hazards present in our living and working environment and their effects on human health. Topics include: exposure assessment, industrial hygiene and safety, pesticides, community and indoor pollution, food-borne diseases, solid and hazardous wastes, water resources, risk assessment, ecological issues and environmental laws.
Credit Only Granted for: HLTH761 or MIEH600.
Formerly: HLTH761.

MIEH605 Fundamentals of Global Health (3 Credits)
Exploration of theoretical frameworks and practicial perspectives in global health with particular attention to the analysis of the biological, epidemiological, social, cultural and behavioral interactions that affect global health study and project implementation. The emphasis is on innovative solutions to health issues in underserved populations.
Credit Only Granted for: SPHL600 or SPHL698A.
Formerly: SPHL698A.

MIEH607 Global Classroom: Risk Based Approach to Ensure Global Food Safety and Security (3 Credits)
This is a collaborative course among the University of Maryland and Cairo University, Cairo, Egypt to explore the One Health Foundation and its application to improving international food safety and security. The purpose of this global class is to disseminate knowledge on One Health and its application to improving global food safety and security. Students will have the opportunity to collaborate with Cairo University and the Agriculture Research Center in Egypt to explore the current status and challenges of global food safety and security.
Jointly offered with: MIEH407.
Credit Only Granted for: MIEH407 or MIEH607.

MIEH609 Methods in Environmental Health (1-3 Credits)
This research-based rotation in environmental health sciences will provide graduate students with the opportunity to work closely with faculty researchers in the Maryland Institute for Applied Environmental Health (MIAEH) within the School of Public Health. Our research covers multiple fields within the environmental health sciences (e.g. environmental epidemiology, exposure science, risk assessment, environmental microbiology, environmental microbiology, environmental microbial genomics, food toxicology, airborne infection transmission, environmental justice, and children's environmental health) that involve either laboratory-based research or non-laboratory based studies. Students will not only gain invaluable research experience and interpersonal skills but also contribute to MIAEH's ongoing environmental health research programs.
Repeatable to: 6 credits.

MIEH610 Global Health Program Planning and Evaluation (3 Credits)
Development of health program and evaluation plans to address critical health problems in international settings, especially transitional or in-conflict countries. Emphasis on linking a tactical program plan to overall health problems of a nation, to include the policy and economic issues involved in assessment, implementation and evaluation.
Recommended: MIEH605.
Credit Only Granted for: MIEH610, SPHL610 or SPHL698D.
Formerly: SPHL698D and SPHL610.

MIEH620 Global Health Communication and Promotion (3 Credits)
Explores the critical components in developing, implementing and evaluating health/population promotion and communication interventions. Emphasis is on theory application to a variety of cultural settings. Formative and quantitative research methods will be utilized.
Recommended: MIEH605.

MIEH688 Seminar in the Maryland Institute for Applied Environmental Health: Current Topics in Environmental Health (1 Credit)
Invited and in-house research presentations from guest scientists, faculty members, and students, and critical analysis of journal articles on current topics in environmental and occupational health.
Repeatable to: 3 credits.

MIEH690 UMD Global STEWARDS: Experiential Exploration of Innovations at the Nexus of Food, Energy, and Water Systems (INFEWS) (2 Credits)
Experiential introduction to broad food, energy, water (FEW) nexus topics, focusing on how integration across the biological, physical, social, behavioral, computer and engineering sciences will be critical in solving FEW systems challenges. FEW nexus issues from molecular to societal levels and from local to global scales will be covered. Course meetings will include active learning-based lectures, discussions, on-campus and off-campus field trips, hands-on activities, brainstorming about interdisciplinary FEW systems projects, and guest lectures.
Restriction: Permission of instructor; and must be in UMD Global STEWARDS Fellows.

MIEH691 UMD Global STEWARDS: Project-Based Data Practicum at the Nexus of Food, Energy, and Water Systems (2 Credits)
The range of food-energy-water (FEW) systems challenges from local to global scales. During the semester, students will gain real-world experience by participating in the conceptualization and/or conduct of an interdisciplinary FEW systems project. Projects may employ engineering, life sciences, epidemiological or policy approaches; earth system sciences frameworks; computational methods; and/or other innovative approaches. Through this work, students will gain hands-on experience in study design, research methods, and data analysis across varying FEW disciplines. Each student will bring a diverse set of expertise to the projects, creating a microcosm for interdisciplinary team science. During the course, students will have the opportunity to refine oral and written communication skills, including team writing. The deliverable for the course may include a grant proposal, a manuscript, a FactSheet, an Op-Ed, or another actionable type of science/policy writing.
Prerequisite: MIEH690, .
Restriction: Permission of instructor; and must be in UMD Global STEWARDS Fellows.

MIEH698 Special Topics in Environmental Health (1-3 Credits)
Special topics in environmental health.
Repeatable to: 12 credits if content differs.

MIEH699 UMD Global STEWARDS: Seminal Findings, and Research and Policy in Progress at the Food, Energy, Water Nexus (1 Credit)
Engaging discourse covering seminal findings, as well as research and policy in progress at the food, energy, water (FEW) nexus. Course meetings will include dissections of groundbreaking FEW nexus articles; presentations by faculty members and students, followed by interdisciplinary discussions; and presentations by visiting leaders working at the FEW nexus across career sectors.
Restriction: Permission of instructor.
Repeatable to: 3 credits.

MIEH700 Advanced Environmental Health (3 Credits)
An advanced doctoral course in environmental health science focused on the application of knowledge gained in foundational and scientific methods courses to solve environmental health problems. The course will engage students in: problem identification; critical evaluation of the existing state of scientific knowledge and gaps regarding the problem; selection and use of appropriate scientific methods to assess the problem; generation of accurate conclusions based on critical evaluation of the findings; and, finally, accurate communication of findings, uncertainties and conclusions to various target audiences and stakeholders.
Prerequisite: MIEH600 and MIEH780; and permission of instructor.

MIEH720 Principles of Toxicology (3 Credits)
Overview of toxicology, including exposure pathways, toxicokinetics, dermal toxicants, carcinogens, and genetic, reproductive, immuno-, nuero-, target organs, complex mixtures, structure-activity analysis, and determinants of hypo- and hyper-susceptibility. Case studies of global national and regional interest.
Prerequisite: MIEH600; or permission of instructor.
Recommended: Must have completed some coursework in chemistry and/or biology.

MIEH721 Physiological Toxicology (3 Credits)
Emphasis on macromolecular, metabolic, cellular, and physiologic targets of environmental contaminants and assays to detect toxic effects at these levels. Discussion of effects of select environmental toxicants in the context of their disruption of normal processes. Examination of the design of short-term assays and their desirable features to maximize usefulness for predicting human disease.
Prerequisite: MIEH600.
Recommended: Must have completed coursework in chemistry, biology, biochemistry, and genetics.

MIEH722 Laboratory Methods in Environmental Health (3 Credits)
Application of chemical principles to environmental monitoring. Basic sampling techniques and laboratory tests to determine chemical and microbiological pollutants in water, air and soil from field-collected samples.
Prerequisite: MIEH600.
Recommended: Must have completed coursework in analytical chemistry, microbiology, biochemistry.

MIEH725 Environmental Analysis (3 Credits)
Fundamentals of environmental chemistry and in environmental media (water, air, soil) and in biota. Theory of sampling, chemical analysis and quality control for major environmental contanimants. Introduction to spatial and statistical analysis, use of maps and Geographic Information Systems, and use of environmental anaylsis in remediation and pollution prevention.
Prerequisite: MIEH600.
Recommended: MIEH722.

MIEH730 Environmental Justice, Built Environment, and Health Disparities (3 Credits)
This course will give students the opportunity to conduct an in-depth analysis of environmental justice and environmental racism in the United States and internationally. Students will synthesize their knowledge from environmental science courses with the concepts of civil rights and social justice to more fully understand the existing health disparities and how the built environment contributes to them.
Prerequisite: Must have completed an Environmental Health course.

MIEH735 Food Toxicology (3 Credits)
An introduction to basic concepts in toxicology in relation to toxic food contaminants and additives; both synthetic and naturally occurring. Focus on exposure routes, molecular targets and susceptible individuals. Also includes regulatory toxicology with respect food toxins.
Recommended: BCHM462, BSCI440, or CHEM131. Cross-listed with NFSC735.
Credit Only Granted for: MIEH735 or NFSC735.

MIEH740 Environmental Health Risk Assessment (3 Credits)
Review of the major methods of human and ecological risk assessment conducted by the U.S. Environment Protection Agency. Emphasis on sources of uncertainty.
Prerequisite: MIEH600; or permission of instructor.

MIEH742 Principles of Industrial Hygiene (3 Credits)
Theory and practice of industrial hygiene, including major industrial exposures and their sampling and measurement. Focus on specific industries, work populations, and environments.
Prerequisite: MIEH600 and MIEH720.

MIEH770 Law and Policy in Environmental Health (3 Credits)
Overview of laws that affect the environment, and the various ways in which businesses are regulated by the government in the interest of protecting the environment. International, Federal, state, and local laws and regulations related to the protection of human health and the regulation of environmental containments, including biological, physical and chemical factors affecting community health. Examination of the interactions between and differing responsibilities of various agencies enforcing environmental laws and regulations.
Prerequisite: MIEH600; or permission of instructor.

MIEH771 Exposure Assessment of Environmental Hazards (3 Credits)
Approaches and methods for determining exposure to environmental contaminants. Biomonitoring and genetic methods to detect recent exposures. Optimizing exposure assessment.
Prerequisite: MIEH600; and must have completed a graduate level statistics course with a B- or higher. Or permission of instructor.

MIEH773 Foodborne, Waterborne and Airborne Infectious Diseases (3 Credits)
In-depth study of foodborne, waterborne and airborne diseases caused by bacteria, viruses and parasites. Topics will include sources and detection of causative agents; their transmission to humans via food, water, air and other environmental media; and methods of disease prevention, including food safety approaches and drinking water treatment. Classes include lectures, discussions, field-trips and hands-on field sampling and laboratory activities.
Corequisite: MIEH600; or permission of instructor.

MIEH778 Practical Experience in Public Health (1-4 Credits)
Practice experience and seminar providing an opportunity to apply previously acquired knowledge and skills in a health or allied health organization. Setting of the practice experience will depend upon the student's background and career goals.
Restriction: Permission of SPHL-Maryland Institute for Applied Environmental Health.
Repeatable to: 4 credits.
Credit Only Granted for: MIEH785 or MIEH778.

MIEH780 Occupational Health (3 Credits)
A synthesis of epidemiology, toxicology, exposure science, risk assessment, and policy. Emphasis will be on methods for anticipating, recognizing, evaluating and controlling workplace hazards; the hierarchy of controls; and current hot topics in occupational health.
Prerequisite: MIEH720 and MIEH771; and must have completed SPHL602. Or permission of instructor.

MIEH783 Proposal Development and Marketing for Public Health Scientists (3 Credits)
Every scientist, whether in academia, government, or industry, must write compelling proposals if they are to succeed in having resources to pursue their passions and interests. To write a compelling proposal, we must develop clear and concise hypotheses and definitive ways to test them. But to have an impact, to get funded, to graduate, we must also excel at marketing our ideas and our achievements to other scientists and the public. This course is designed for doctoral students and postdoctoral fellows who want to develop and hone their proposal development and marketing skills.

MIEH785 Internship in Public Health (3 Credits)
Internship and seminar providing an opportunity to apply previously acquired knowledge and skills in a health or allied health organization. Setting of the internship will depend upon the student's background and career goals.
Restriction: Permission of SPHL-Maryland Institute for Applied Environmental Health.
Credit Only Granted for: MIEH785 or MIEH778.

MIEH786 Capstone Project in Public Health (3 Credits)
Capstone experience provding opportunity to apply knowledge and skills to a specific public health problem or issue. Completion of project relevant to public health under the direction of an advisor.
Prerequisite: Permission of SPHL-Maryland Institute for Applied Environmental Health.

MIEH788 Critical Readings in Environmental Health (1-3 Credits)
In-depth examination and critical discussion of the current literature relevant to environmental health.
Prerequisite: MIEH600.
Repeatable to: 3 credits if content differs.

MIEH789 Independent Study (1-6 Credits)
Individual reading and/or research under a specific faculty member in the department.
Prerequisite: Permission of SPHL-Maryland Institute for Applied Environmental Health.

MIEH799 Master's Thesis Research (1-6 Credits)

MIEH899 Doctoral Dissertation Research (1-8 Credits)

MITH - Maryland Institute for Technology in the Humanities

MITH498 Special Topics in Applied Digital Humanities (3 Credits)
An introduction to special topics, and technical approaches, for theoretically grounded humanities and social sciences digital research. Class meetings will introduce students to a variety of technical approaches potentially applicable to the specific topical foci; the theoretical basis for selecting, evaluating, and modifying technical approaches; and best practices in project management.
Repeatable to: 9 credits if content differs.

MITH610 Introduction to Digital Studies in the Arts and Humanities (3 Credits)
An introduction to digital studies in the arts and humanities, broadly conceived as the critical, creative, and practical engagement with digital media, methods, tools, and experiences, as well as the theoretical and conceptual bases for understanding them.

MITH628 Special Topics in Digital Humanities (3 Credits)
A graduate level introduction to special topics, and technical approaches, for theoretically grounded humanities and social sciences digital research. Class meetings will introduce students to a variety of technical approaches potentially applicable to the specific topical foci; the theoretical basis for selecting, evaluating, and modifying technical approaches; and best practices in project management.
Repeatable to: 9 credits if content differs.

MITH729 Colloquium in Digital Studies (1 Credit)
Colloquium in support of the ARHU-MITH Graduate Certificate in Digital Studies. We will meet periodically (approximately 4-5 times a semester) to read and discuss current work in the field, interact with visiting speakers, share work in progress, learn new tools and methods, and hear research presentations from one another.
Repeatable to: 3 credits.

MITH735 Anatomy of Digital Humanities Research (3 Credits)
Positioned as a companion to a disciplinary research methods course, this course emphasizes best practices and critical approaches in the context of the lifecycle of a collaborative research project from ideation to publication to preservation. This course explores common digital methodologies as it teaches collaboration and fast prototyping to help students develop a reflexive critical approach to digital research projects. Upon completing the course, students will have a research plan, including the beginnings of a literature review, wireframes, and proposal for the lifecycle of the research project.

MITH741 Creative Ambiguities: Embodiment, Text, and the Digital Humanities (3 Credits)
The course asks what theoretical and applied research emerges out of the space of digital humanities and the performing arts. It will equip students with a nuanced overview of the history of the digital within performance and explore various technical approaches that can enable the exploration of intersections of research and practice, the connections between creation and research, and yes, even "cool" performance.
Prerequisite: MITH610; or permission of instructor.
Recommended: MITH610 and MITH735.

MLAW - MPower Undergraduate Law Programs

MLAW404 Law & Society Capstone (3 Credits)
An exploration of the implications of technology on law and society from a variety of perspectives.Significant issues will be taken from contemporary scholarship and court cases.
Restriction: Student must be enrolled in the Law and Society minor.

MLAW411 Appellate Advocacy I (3 Credits)
By the end of this class, and with proper supervision, students should be able to competently brief and argue an appeal before any appellate court in the country. The skills taught in this class also transfer to other contexts that demand clear legal analysis, efficient and comprehensive legal research, excellent writing and effective oral advocacy. For students interested in pre-law skills, whether they plan to go to law school or some career that requires analytical reasoning, persuasive writing, and advocacy skills.
Recommended: MLAW304.

MOCB - Molecular and Cell Biology

MOCB608 Molecular and Cell Biology Seminar (1-2 Credits)
Seminar in molecular and cell biology.
Repeatable to: 5 credits if content differs.

MOCB639 Advanced Cell Biology (3 Credits)
Recent advances in key areas of modern cell biology.
Repeatable to: 6 credits if content differs.

MOCB699 Laboratory Rotation (2-3 Credits)
Laboratory experience in molecular-cell biology.
Prerequisite: Permission of CMNS-Molecular & Cell Biology Program (MCB).
Restriction: Must be in one of the following programs (Cell Biology and Molecular Genetics (Doctoral); Cell Biology and Molecular Genetics (Master's)).
Repeatable to: 6 credits if content differs.

MOCB708 Advanced Topics in Molecular and Cell Biology (1-4 Credits)
Lectures, experimental courses, and other special instructions in various areas of molecular or cell biology.
Repeatable to: 6 credits if content differs.

MOCB898 Pre-Candidacy Research (1-8 Credits)

MOCB899 Doctoral Dissertation Research (1-8 Credits)

MSML - Machine Learning

MSML601 Probability and Statistics (3 Credits)
Provides a solid understanding of the fundamental concepts of probability theory and statistics. The course covers the basic probabilistic concepts such as probability space, random variables and vectors, expectation, covariance, correlation, probability distribution functions, etc. Important classes of discrete and continuous random variables, their inter-relation, and relevance to applications are discussed. Conditional probabilities, the Bayes formula, and properties of jointly distributed random variables are covered. Limit theorems, which investigate the behavior of a sum of a large number of random variables, are discussed. The main concepts random processes are then introduced. The latter part of the course concerns the basic problems of mathematical statistics, in particular, point and interval estimation and hypothesis testing.
Prerequisite: Undergraduate courses in calculus and basic linear algebra.
Cross-listed with: DATA601, BIOI601, MSAI601.
Credit Only Granted for: BIOI601, DATA601, MSAI601 or MSML601.

MSML602 Principles of Data Science (3 Credits)
An introduction to the data science pipeline, i.e., the end-to-end process of going from unstructured, messy data to knowledge and actionable insights. Provides a broad overview of what data science means and systems and tools commonly used for data science, and illustrates the principles of data science through several case studies.
Cross-listed with: DATA602, BIOI602, MSAI602.
Restriction: Must be in one of the following programs: (Data Science Post-Baccalaureate Certificate, Master of Professional Studies in Data Science and Analytics, or Master of Professional Studies in Machine Learning).
Credit Only Granted for: BIOI602, DATA602, MSAI602, MSML602 or CMSC641.
Formerly: CMSC641.

MSML603 Principles of Machine Learning (3 Credits)
A broad introduction to machine learning and statistical pattern recognition. Topics include: Supervised learning: Bayes decision theory, discriminant functions, maximum likelihood estimation, nearest neighbor rule, linear discriminant analysis, support vector machines, neural networks, deep learning networks. Unsupervised learning: clustering, dimensionality reduction, PCA, auto-encoders. The course will also discuss recent applications of machine learning, such as computer vision, data mining, autonomous navigation, and speech recognition.
Cross-listed with: DATA603, BIOI603, MSAI603, MSQC603.
Restriction: Must be in one of the following programs: (Data Science Post-Baccalaureate Certificate, Master of Professional Studies in Data Science and Analytics, or Master of Professional Studies in Machine Learning).
Credit Only Granted for: BIOI603, DATA603, MSAI603, MSML603, MSQC603 or CMSC643.
Formerly: CMSC643.

MSML604 Introduction to Optimization (3 Credits)
Focuses on recognizing, solving, and analyzing optimization problems. Linear algebra overview: vector spaces and matrices, linear transformations, matrix algebra, projections, similarity transformations, norms, eigen-decomposition and SVD. Convex sets, convex functions, duality theory and optimality conditions. Unconstrained optimization: 1D search, steepest descent, Newton's method, conjugate gradient method, DFP and BFGS methods, stochastic gradient descent. Constrained optimization: projected gradient methods, linear programming, quadratic programming, penalty functions, and interior-point methods. Global search methods: simulated annealing, genetic algorithms, particle swarm optimization.
Prerequisite: Undergraduate courses in calculus and basic linear algebra.
Recommended: DATA601.

MSML605 Computing Systems for Machine Learning (3 Credits)
Programming, software and hardware design and implementation issues of computing systems for machine learning. Topics in the programming/software domain will include: basic Python program structure, variables and assignment, built-in data types, flow control, functions and modules; basic I/O, and file operations. Classes, object-oriented programming and exceptions. Regular expressions, database access, network programming and sockets. Introduction to the Numpy, Scipy and Matplotlib libraries. Topics in the hardware domain include computer architecture, CPUs, single- and multi-core architectures, GPUs, memory and I/O systems, persistent storage, and virtual memory. Parallel processing architectures, multiprocessing and cluster processing.
Cross-listed with: MSAI605.
Restriction: Must be in the MPS in Machine Learning program.
Credit Only Granted for: MSML605 or MSAI605.

MSML606 Algorithms and Data Structures for Machine Learning (3 Credits)
Provides both a broad coverage of basic algorithms and data structures. Topics include sorting, searching, graph and string algorithms; greedy algorithm, branch-and-bound, dynamic programming and job scheduling; Arrays, linked lists, queues, stacks, and hash tables; Algorithm complexity, best/average/worst case analysis. Applications selected from machine learning problems.

MSML612 Deep Learning (3 Credits)
Provides an introduction to the construction and use of deep neural networks: models that are composed of several layers of nonlinear processing. The class will focus on the main features in deep neural nets structures. Specific topics include backpropagation and its importance to reduce the computational cost of the training of the neural nets, various coding tools available and how they use parallelization, and convolutional neural networks. Additional topics may include autoencoders, variational autoencoders, convolutional neural networks, recurrent and recursive neural networks, generative adversarial networks, and attention-based models. The concepts introduced will be illustrated by examples of applications chosen among various classification/clustering questions, computer vision, natural language processing.
Prerequisite: DATA603 or MSML603.
Cross-listed with: DATA612, MSAI612.
Credit Only Granted for: DATA612, MSAI612 or MSML612.

MSML640 Computer Vision (3 Credits)
An introduction to basic concepts and techniques in computer vision. Topics include low-level operations such as image filtering, correlation, edge detection and Fourier analysis. Image segmentation, texture and color analysis. Perspective, cameras and 3D reconstruction of scenes using stereo and structure from motion. Deep learning for object detection, recognition and classification in images and video.
Prerequisite: BIOI603, DATA603, or MSML603.
Cross-listed with: DATA640, MSAI640.
Credit Only Granted for: MSML640, MSAI640 or DATA640.

MSML641 Natural Language Processing (3 Credits)
Introduces fundamental concepts and techniques involved in getting computers to deal more intelligently with human language. Focused primarily on text (as opposed to speech), the class will offer a grounding in core NLP methods for text processing (such as lexical analysis, sequential tagging, syntactic parsing, semantic representations, text classification, unsupervised discovery of latent structure), key ideas in the application of deep learning to language tasks, and consideration of the role of language technology in modern society.
Prerequisite: DATA603 or MSML603.
Cross-listed with: DATA641, MSAI641.
Credit Only Granted for: DATA641, MSAI641 or MSML641.

MSML650 Cloud Computing (3 Credits)
Presents the state of the art in cloud computing technologies and applications. Topics will include: telecommunications needs, architectural models for cloud computing, cloud computing platforms and services. Data center networking, server, network and storage virtualization technologies, and containerization. Cloud operating and orchestration systems. Security, privacy, and trust management; resource allocation and quality of service; interoperability and internetworking.
Cross-listed with: DATA650.
Credit Only Granted for: MSML650 or DATA650.

MUED - Music Education

MUED411 Teaching Elementary Instrumental Music II (4 Credits)
Prepare instrumental-emphasis music education majors to synthesize the knowledge and skills that will enable them to develop and/or maintain an exemplary curricular-oriented, research-based, comprehensive elementary instrumental music program.
Prerequisite: MUED320 and MUED311.
Restriction: Must be in Music Education program.

MUED420 Teaching Secondary Instrumental Music II (4 Credits)
Prepare instrumental-emphasis music education majors to synthesize the knowledge and skills that will enable them to develop and/or maintain an exemplary, curricular-oriented, research-based, comprehensive secondary instrumental program.
Prerequisite: MUED320 and MUED311.
Restriction: Must be in Music Education program.

MUED422 Teaching General Music II (4 Credits)
Designed as an advanced music methods course and field experience for students who are preparing for a career in general music. The field experience is a practicum that is co-supervised by the university instructor and a general music educator.
Prerequisite: MUED322 and MUED333.
Restriction: Must be in Music Education program.
Credit Only Granted for: MUED422 or MUED471.
Formerly: MUED471.

MUED433 Teaching Choral Music (4 Credits)
Preparation for teaching choral classes through the integration of conducting technique, vocal pedagogy, knowledge of repertoire, and the application of appropriate instructional strategies in the context of peer teaching and field experience assignments.
Prerequisite: MUED422.
Restriction: Must be in Music Education program.
Credit Only Granted for: MUED472 or MUED433.
Formerly: MUED472.

MUED473 Teaching General Music for Instrumentalists (2 Credits)
Introduction to current trends, materials and approaches in general music instruction.
Prerequisite: MUED311; and MUED320.
Restriction: Must be in Music Education program.

MUED474 Field Experiences: Pre-Student Teaching (2 Credits)
Field experiences to fulfill teaching requirements in K-12 music teacher education program.
Prerequisite: MUED420 and MUED411; or (MUED433 and MUED422).
Restriction: Permission of ARHU-School of Music department; and senior standing.

MUED484 Student Teaching in Elementary School: Music (6 Credits)
Fulfills elementary teaching requirements in K-12 music teacher education program. Limited to music education majors who have previously applied.
Corequisite: MUED494.
Restriction: Permission of ARHU-School of Music department; and must be in Music Education program.

MUED489 Field Experiences (1 Credit)
Series of field experiences in K-12 settings.
Restriction: Permission of ARHU-School of Music department; and must be in Music Education program.
Repeatable to: 6 credits.

MUED494 Student Teaching in Secondary School: Music (6 Credits)
Fulfill secondary teaching requirements in K-12 music teacher education program. Limited to music education majors who have previously applied.
Corequisite: MUED484.
Restriction: Permission of ARHU-School of Music department; and must be in Music Education program.

MUED499 Workshops, Clinics, Institutes (1-3 Credits)
Innovative and experimental dimensions of music education offered to meet the needs of music teachers and music supervisors allowing students to individualize their programs.
Repeatable to: 6 credits if content differs.

MUED669 Domain Project in Music Education I (3 Credits)
Application of musicological and/or ethnomusicological concepts within the context of PreK-12 music teaching and learning. Synthesis of knowledge and skills related to musicology, musicology, and/or ethnomusicology pedagogy, curriculum development, and social sciences research through the development and execution of a classroom-based domain project.
Restriction: Permission of the School of Music.

MUED672 Advanced Instrumental Methods in Music Education (3 Credits)
Teaching instrumental music in the K-12 setting, including recruiting, literature selection, curriculum, rehearsal techniques, and pedagogical approaches.
Restriction: Permission of ARHU-School of Music department.

MUED673 Beginning String Instruction: Principles and Applications in Group Process (3 Credits)
A survey of string instrument techniques, pedagogy, and materials for the elementary school. Includes hands-on review and extension of beginning-level string playing and teaching techniques through an organized, sequential approach.
Restriction: Permission of ARHU-School of Music department.

MUED677 Advanced Studies in Choral Music Education (3 Credits)
A critical review of choral music education in both school and community. Includes historical foundations, philosophical perspectives, and practical teaching applications in light of current scholarship.
Restriction: Permission of ARHU-School of Music department.

MUED679 Domain Project in Music Education II (3 Credits)
Application of concepts from music theory within the context of PreK-12 music teaching and learning. Synthesis of knowledge and skills related to music theory pedagogy, curriculum development, and social sciences research through the development and execution of a classroom-based domain project.
Restriction: Permission of the School of Music.

MUED688 Music Cultures in the Classroom II: Curriculum Materials and Teaching Strategies (3 Credits)
Designed to assist the music teacher in integrating music from selected cultures into the curriculum. Curriculum materials are presented and teaching strategies demonstrated.
Recommended: MUED687.
Restriction: Must be in a major within ARHU-School of Music department.
Repeatable to: 9 credits if content differs.

MUED689 Domain Project in Music Education III (3-6 Credits)
Application of concepts from music performance pedagogy within the context of PreK-12 music teaching and learning. Synthesis of knowledge and skills related to music performance pedagogy, curriculum development, and social sciences research through the development and execution of a classroom-based domain project.
Restriction: Permission of the School of Music.

MUED690 Research Methods in Music and Music Education (3 Credits)
The application of methods of research to problems in the fields of music and music education. The preparation of bibliographies and the written exposition of research projects in the area of the student's major interest.

MUED691 Psychology of Music Teaching and Learning (3 Credits)
An overview of the psychological bases of musical behavior, with particular emphasis on the teaching and learning of music.
Restriction: Permission of ARHU-School of Music department.

MUED692 Foundations and Perspectives of Music Education (3 Credits)
An introduction to historical, sociological, and philosophical perspectives of music education.
Restriction: Permission of ARHU-School of Music department.

MUED697 Curriculum & Assessment in Music Education (3 Credits)
Theoretical and practical knowledge related to curriculum,assessment, and evaluation in music education. Course topics include: a) aspects of philosophy,sequencing, and design in music curricula; b) reliability, validity, and fairness in assessment; c) planning for and designing assessment of student knowledge and skills; d) policy, procedures, and outcomes associated with music teacher evaluation.

MUED698 Current Trends in Music Education (1-3 Credits)
A survey of current and emerging philosophies, methodologies and curricula in music education and their implementation. The influence of educational and social changes and the expanding musical scene upon the music programs for children of all ages and for teacher education.
Repeatable to: 8 credits if content differs.

MUED699 Workshops, Clinics, Institutes (1-3 Credits)
Innovative approaches to various dimensions of music education are offered to meet the pedagogical needs of music teachers. The maximum number of credits tht may be earned under this course symbol toward any degree is six semester hours; the symbol may be used two or more times unti sixsemester hours have been reached.
Repeatable to: 10 credits.

MUED729 Doctoral Colloquium in Music Education (1 Credit)
For students in PhD Progam in Music Education. Meets approximately 4-5 times per semester to read and discuss current work in the field, interact with visiting speakers, share work in progress, learn new tools and methods, and hear research presentations from one another
Restriction: Permission of instructor.
Repeatable to: 6 credits.

MUED780 Seminar in Music Teacher Education (3 Credits)
Development of knowledge and skills necessary for music teacher educators. Topics include history of and reform movements in music teacher education, recruitment, education and certification of music teachers and inservice programs.
Restriction: Must have doctoral standing in a Music Education program.

MUED785 Teaching Music in Higher Education (3 Credits)
Prepare students for music faculty positions in higher education institutions. The course readings, discussions, assignments, and experiences are aimed to develop the knowledge, skills, and dispositions necessary to be a successful member of the faculty at a variety of institutions.

MUED790 Design and Analysis of Research in Music Education (3 Credits)
Advanced applications of quantitative and qualitative social science research paradigms to research problems in the field of music education. Topics include the formation of researchable questions; the design of experimental, quasi-experimental, descriptive, and qualitative research studies; and the analysis and interpretation of research data.
Prerequisite: Must have completed a college-level statistics course. And MUED690; or an equivalent master's level research in music education course.

MUSC - School of Music

MUSC400 Music Pedagogy (3 Credits)
Conference course. A study of major pedagogical treatises in music, and an evaluation of pedagogical techniques, materials, and procedures.
Prerequisite: MUSP315; and permission of ARHU-School of Music department.

MUSC420 Introduction to Ethnomusicology (3 Credits)
Study of principal concepts and methods in ethnomusicology, covering history of field, linguistics and anthropology, music in various settings, musical cognition and ethnography of performance.
Prerequisite: MUSC210 and MUSC130; or permission of ARHU-School of Music department.
Restriction: Junior standing or higher.

MUSC428 Repertoire Coaching of Vocal or Chamber Music (2 Credits)
A course for piano students who wish to go further than the work offered in MUSC128, MUSC228 and MUSC328 by becoming specialists in the areas of vocal coaching or chamber music coaching. Elements of pedagogy, conducting and responsible artistic decision-making for the entire musical production.
Prerequisite: Must have completed or be concurrently enrolled in MUSC328.

MUSC434 Creating Historic Woodwinds (3 Credits)
Students will learn the art of woodworking and blend techniques of modern and historic instrument-making methods. Using wood lathes, metalworking tools, 3d scanners and selective laser sintering 3d printers. Student teams will first train to acquire the skills needed to use fabrication equipment. Each mixed team will then share their individual discipline's skills to help contribute to the creation of a completed musical instrument. Along the way, we'll explore the historical and cultural context of instrument making and the musical period.
Cross-listed with: ENES434.
Restriction: Permission of the School of Music.
Credit Only Granted for: ENES434 or MUSC434.

MUSC436 Jazz: Then and Now (3 Credits)
Major styles and influential artists of the past 75 years of jazz.

MUSC438 Area Studies in Ethnomusicology (3 Credits)
Advanced study of musics in selected parts of the world.
Repeatable to: 9 credits if content differs.

MUSC439 Collegium Musicum (1 Credit)
Open to undergraduates and graduates, music majors and non-majors. Procurement, edition and performance of music not belonging to a standard repertory: early music, compositions for unusual performing media, works which demand reconstruction of their original circumstances of performance. Outcome of a semester's work may be one or more performances for the public.
Prerequisite: Permission of ARHU-School of Music department.
Repeatable to: 5 credits.

MUSC442 Creating Historic Woodwinds (3 Credits)
In this class, students will learn the art of woodworking and blend techniques of modern and historic instrument-making methods. Using wood lathes, metalworking tools, 3d scanners and selective laser sintering 3d printers. Student teams will first train to acquire the skills needed to use fabrication equipment. Each mixed team will then share their individual discipline's skills to help contribute to the creation of a completed musical instrument. Along the way, we'll explore the historical and cultural context of instrument making and the musical period.
Cross-listed with: ENES442.
Credit Only Granted for: MUSC442 or ENES442.

MUSC443 Solo Vocal Literature (3 Credits)
The study of solo vocal literature from the Baroque Cantata to the Art Song of the present. The Lied, Melodie, vocal chamber music and the orchestral song are examined.
Prerequisite: MUSC330 and MUSC331; or students who have taken courses with comparable content may contact the department.

MUSC444 Wind and Percussion Literature (1 Credit)
Recital program notes and written projects in wind or percussion literature.
Prerequisite: Permission of ARHU-School of Music department.
Corequisite: MUSP420 or MUSP419.

MUSC445 Survey of the Opera (3 Credits)
A study of the music, librettos and composers of the standard operas.
Prerequisite: MUSC330 and MUSC331; or students who have taken courses with comparable content may contact the department.

MUSC446 String Literature (1 Credit)
Recital program notes and written projects in string literature.
Prerequisite: MUSP316; and permission of ARHU-School of Music department.

MUSC448 Selected Topics in Music (1-3 Credits)
Prerequisite: Permission of ARHU-School of Music department.
Repeatable to: 6 credits if content differs.

MUSC448E Arts Entrepreneurship and the Creative Profession (3 Credits)
Introduces students to arts entrepreneurship in preparation for diverse and ever-changing careers in the creative fields. Students will practice and develop their entrepreneurial mindsets and learn about different frameworks for audience engagement. Topics include financial management, revenue development, business planning, and the "need-to-knows" of the gig economy. Throughout the semester, students will have the opportunity to learn from a variety of entrepreneurs in the arts and to evaluate their future career paths.
Recommended: ARHU240.
Cross-listed with: ARHU340.
Credit Only Granted for: ARHU340 or MUSC448E.

MUSC450 Musical Form (3 Credits)
A study of the principles of organization in music with emphasis on eighteenth and nineteenth century European music. Reading and analysis of scores exemplifying the musical forms.
Prerequisite: MUSC251.

MUSC451 Analysis of Music (3 Credits)
A course in the analysis of music. Discussion of individual works, with emphasis on their unique characteristics and on the relation of analysis to performance.
Prerequisite: MUSC450; or permission of instructor.

MUSC453 Jazz Improvisation I (3 Credits)
Jazz theory, notational conventions, improvisation techniques, reading and analysis of music, and performance in small combo format.
Prerequisite: MUSC251; or students who have taken courses with comparable content may contact the department. And permission of ARHU-School of Music department.
Credit Only Granted for: MUSC345 or MUSC453.
Formerly: MUSC345.

MUSC454 Jazz Improvisation II (3 Credits)
Continuation of MUSC453 including scoring and transcription.
Prerequisite: MUSC453; or students who have taken courses with comparable content may contact the department. And permission of ARHU-School of Music department.
Credit Only Granted for: MUSC346 or MUSC454.
Formerly: MUSC346.

MUSC455 Theory of Jazz (3 Credits)
Analysis of jazz harmony, with emphasis on principles of substitution, reharmonization, and syntax. Topics may also include chord/scale relationships, phrasing and articulation, notation, and introductory arranging concepts such as orchestration and form.
Prerequisite: MUSC250; or permission of ARHU-School of Music department.
Restriction: Must be in a major within ARHU-School of Music department.

MUSC456 Jazz Arranging (3 Credits)
A comprehensive approach to jazz arranging. Topics to include chord scale theory, voicing techniques, part and score layout, and formal construction of an arrangement.
Prerequisite: MUSC455; and permission of ARHU-School of Music department.
Credit Only Granted for: MUSC448N or MUSC456.
Formerly: MUSC448N.

MUSC460 Tonal Counterpoint I (3 Credits)
A course in Eighteenth-Century contrapuntal techniques, analysis and original composition of two-voice dances, preludes, and inventions. Includes an introduction to the study of fugue and canon.
Prerequisite: MUSC251; or permission of ARHU-School of Music department.

MUSC461 Theory and Analysis of Atonal and Twelve-tone Music (3 Credits)
An advanced technical introduction to theory and analysis of atonal and twelve-tone music, with an emphasis on music by Schoenberg, Webern, Bartok, and Stravinsky.
Prerequisite: MUSC251 and MUSC450; and permission of ARHU-School of Music department.
Restriction: Must be in Music Theory and Composition program. Jointly offered with MUSC661.
Credit Only Granted for: MUSC46 1 or MUSC661.

MUSC463 Technology and a Career in Music (3 Credits)
A hands-on introduction to technology as it applies to music creation and recording. Digital audio workstations, music notation software, and cloud-based music technology are used to create and manipulate musical examples with an eye toward their practical applications for professional musicians.
Recommended: Ability to read music on a grand staff (treble and bass clef).
Additional Information: No previous experience with technology is required.

MUSC464 The Theories of Heinrich Schenker (3 Credits)
An advanced analysis course in tonal music with specific emphasis on the theories of the early 20th century theorist Heinrich Schenker. Specific analyses of music by Bach, Mozart, Haydn, Beethoven, Chopin, and Brahms.
Prerequisite: MUSC251 and MUSC450; and permission of ARHU-School of Music department.
Restriction: Must not have completed MUSC651.
Credit Only Granted for: MUSC464 or MUSC651.

MUSC467 Piano Pedagogy I (3 Credits)
A study of major pedagogical treatises in music, and an evaluation of pedagogical techniques, materials, and procedures.
Prerequisite: Permission of ARHU-School of Music department.

MUSC468 Piano Pedagogy II (3 Credits)
Application of the studies begun in MUSC467 to the actual lesson situation. Evaluation of results.
Prerequisite: MUSC467; and permission of ARHU-School of Music department.
Repeatable to: 6 credits.

MUSC469 Orchestral Excerpts for String Players (1 Credit)
In-depth study of the orchestral excerpts required for professional orchestra auditions.
Restriction: Permission of ARHU-School of Music department.
Repeatable to: 6 credits if content differs.
Credit Only Granted for: MUSC469, MUSC448B, MUSC448Q, MUSC448V, or MUSC448X.
Formerly: MUSC448B, MUSC448Q, MUSC448V, and MUSC448X.

MUSC470 Harmonic and Contrapuntal Practices of the Twentieth Century (3 Credits)
A theoretical and analytical study of twentieth century materials.
Prerequisite: MUSC251; or students who have taken courses with comparable content may contact the department. And permission of ARHU-School of Music department.

MUSC471 Contemporary Compositional Techniques (3 Credits)
Continuation of MUSC470, with emphasis on the analysis of individual works written since 1945.
Prerequisite: MUSC470; or permission of ARHU-School of Music department.

MUSC472 Music Composition for Music Majors (3 Credits)
A course for music majors who wish to develop skills and creative abilities in music composition. Student writing projects will be discussed in class and models of compositional techniques will be studied in literature from diverse styles and style periods.
Prerequisite: MUSC450 or equivalent; and permission of instructor.
Restriction: Registration restricted to music majors who are not majoring in music composition (cannot be in Major code: 1004B).
Credit Only Granted for: MUSC448O or MUSC472.
Formerly: MUSC448O.

MUSC481 Music in the Renaissance (3 Credits)
Survey of western music from 1450 to 1600.

MUSC482 Music in the Baroque Era (3 Credits)
Survey of western music from 1600 to 1750.

MUSC484 Music in the Romantic Era (3 Credits)
Survey of western music from 1820 to 1900.

MUSC486 Orchestration I (3 Credits)
A study of the ranges, musical functions and technical characteristics of the instruments and their color possibilities in various combinations. Practical experience in orchestrating for small and large ensembles.
Prerequisite: MUSC251; and permission of ARHU-School of Music department.

MUSC490 Conducting (2 Credits)
Vocal and instrumental baton techniques.
Prerequisite: MUSC251.

MUSC491 Conducting II (2 Credits)
Baton techniques applied to score reading, rehearsal techniques, tone production, style and interpretation.
Prerequisite: MUSC490; or students who have taken courses with comparable content may contact the department.

MUSC492 Keyboard Music I (3 Credits)
The history and literature of harpsichord and solo piano music from its beginning to the romantic period. Emphasis is placed on those segments of repertory which are encountered in performance and teaching situations at the present time.
Prerequisite: Permission of ARHU-School of Music department.

MUSC493 Keyboard Music II (3 Credits)
The history and literature of harpsichord and solo piano music from the Romantic period to the present. Emphasis is placed on those segments of repertory which are encountered in performance and teaching situations at the present time.
Prerequisite: MUSC492; and permission of ARHU-School of Music department.

MUSC499 Independent Studies (1-3 Credits)
Independent research on a topic chosen in consultation with the instructor, which may culminate in a paper or appropriate project.
Prerequisite: Permission of ARHU-School of Music department.
Repeatable to: 18 credits.

MUSC601 Advanced English Lyric Diction (1 Credit)
Concepts, strategies and techniques for singing operatic, oratorio and song literature in English: stress patterns, linkage, stressed and non stressed vowels, dipthongs, placement of consonants and vowels, and communication of text with emphasis on current performance practices. Use of the International Phonetic Alphabet (IPA) will be stressed.
Restriction: Must be in one of the following programs (Music - Doctoral (Doctoral); Music - Master (Master's)) . And permission of instructor; or admission to graduate voice program.

MUSC602 Advanced Italian Lyric Diction (1 Credit)
Concepts, strategies and techniques for singing operatic and song literature in Italian: syllabification, vowels, stressed and unstressed syllables, dipthongs, glides and elisions, single and double consonants with emphasis on current performance practices.
Restriction: Must be in one of the following programs (Music - Doctoral (Doctoral); Music - Master (Master's)) . And permission of instructor; or admission to graduate voice program.

MUSC603 Advanced German Lyric Diction (1 Credit)
Concepts, strategies and techniques for singing operatic and song literature in German: single and double consonants, the use of the glottal, the German closed (e) and (o) vowels, the "schwa" and consonant clusters. Mastery of the International Phonetic Alphabet (IPA) as it applies to "Hochdeutsch" will be expected.
Restriction: Must be in one of the following programs (Music - Doctoral (Doctoral); Music - Master (Master's)) . And permission of instructor; or admission to graduate voice program.

MUSC604 Advanced French Lyric Diction (1 Credit)
Concepts, strategies and techniques for singing operatic and song literature in French: phoneticization, formation and singing of the vowel-sounds, semi-consonants, and consonants; the liaison; legato singing in French; the hiatus, mute and aspirate 'h'; stress and word rhythm. Use of the International Phonetic Alphabet (IPA) will be stressed.
Restriction: Must be in one of the following programs (Music - Doctoral (Doctoral); Music - Master (Master's)) . And permission of instructor; or admission to graduate voice program.

MUSC605 Opera Repertory I (1 Credit)
Advanced vocal coaching of selections from the Italian, French, German, and English opera repertory: musical accuracy; language facility; diction clarity; and dramatic interpretation.
Prerequisite: MUSC602; or permission of instructor.
Restriction: Must be in one of the following programs (Music - Doctoral (Doctoral); Music - Master (Master's)).

MUSC606 Opera Repertory II (1 Credit)
Continuation of MUSC 605. Advanced vocal coaching of selections from the Italian, French, German and English opera repertory: musical accuracy, language facility; diction clarity; and dramatic interpretation.
Prerequisite: MUSC605; or permission of instructor.
Restriction: Must be in one of the following programs (Music - Doctoral (Doctoral); Music - Master (Master's)).

MUSC608 Chamber Music Repertory (1-3 Credits)
Prerequisite: graduate standing as a major in performance. A study, through performance, of diversified chamber music for standard media.
Repeatable to: 99 credits.
Additional Information: May be repeated for credit to the maximum credit designated in the student's major degree program.

MUSC609 Piano Chamber Music Practicum and Analysis (2 Credits)
Study of repertoire written for piano in duos or with several instruments, to develop an accompanists advanced performance skills in listening, balance, nuance in dynamics, harmonic motion and phrasing.
Restriction: Permission of ARHU-School of Music department.
Repeatable to: 4 credits.

MUSC610 Research Methods, Bibliography, and Guided Writings (3 Credits)
Survey of bibliographic material in ethnomusicology. Guided writing utilizing specific bibliography.

MUSC611 Opera Techniques I (2 Credits)
Techniques for opera performance: Improvisation; Acting I, Scene Study I; and Movement I. Practical application of styles and techniques to operatic repertoire.
Corequisite: MUSC601.
Restriction: Permission of director of opera; and must be in one of the following programs (Music - Doctoral (Doctoral); Music - Master (Master's)).

MUSC612 Opera Techniques II (2 Credits)
Continuation of MUSC 611. Techniques for opera performance: Scene Study II; Movement II; and Mask.
Prerequisite: Minimum grade of B- in MUSC611.
Corequisite: MUSC602.
Restriction: Must be in one of the following programs (Music - Doctoral (Doctoral); Music - Master (Master's)) ; and permission of Director of Opera required.

MUSC613 Opera Techniques III (2 Credits)
Continuation of MUSC 612. Techniques for opera performance: Scene Study III; Movement III; and Shakespeare.
Prerequisite: Minimum grade of B- in MUSC612; and permission of Director of Opera required.
Corequisite: MUSC603 and MUSC605.
Restriction: Must be in one of the following programs (Music - Doctoral (Doctoral); Music - Master (Master's)).

MUSC614 Opera Techniques IV (2 Credits)
Continuation of MUSC 613. Techniques for opera performance: Scene Study IV and Movement IV.
Prerequisite: Minimum grade of B- in MUSC613.
Corequisite: MUSC606 and MUSC604.
Restriction: Must be in one of the following programs (Music - Doctoral (Doctoral); Music - Master (Master's)) ; and permission of Director of Opera required.

MUSC629 Ensemble (1 Credit)
Rehearsal and performance of selected works for small and large instrumental ensembles.
Repeatable to: 36 credits.

MUSC631 Seminar in Organology (3 Credits)
Advanced study of musical instruments of the world, their morphology, musical and cultural function.
Restriction: Permission of ARHU-School of Music department.

MUSC632 The Anthropology of Music (3 Credits)
Explores how leading theoretical paradigms in socio-cultural anthropology have been incorporated into and shaped ethnomusicological research.
Restriction: Permission of ARHU-School of Music department.
Credit Only Granted for: MUET650 or MUSC632.
Formerly: MUET650.

MUSC633 Field Methods in Ethnomusicology (3 Credits)
Introduction to ethnographic theory and fieldwork methods (participant observation, interviewing, etc.) in ethnomusicology. Students develop and carry out their own fieldwork projects as part of the course.
Restriction: Permission of ARHU-School of Music department.

MUSC634 Field Methods in Ethnomusicology II (3 Credits)
Advanced training in field research techniques and issues including multimedia recording and data management, interview and survey techniques, grant writing, and research ethics.
Prerequisite: MUSC660.
Restriction: Permission of ARHU-School of Music department.
Credit Only Granted for: MUET661 or MUSC634.
Formerly: MUET661.

MUSC636 Field Methods in Ethnomusicology III (3 Credits)
Continuation of Field Methods in Ethnomusicology II. Further development of skills in data collection and interpretation, culminating in an urban musical ethnography project and document.
Prerequisite: MUSC634.
Restriction: Permission of ARHU-School of Music department.
Credit Only Granted for: MUET662 or MUSC636.
Formerly: MUET662.

MUSC639 Seminar in Music (3 Credits)
The work of one major composer (Bach, Beethoven, etc.) will be studied.
Prerequisite: MUSC330 and MUSC331.
Restriction: Permission of instructor.
Repeatable to: 99 credits if content differs.

MUSC643 Seminar in Solo Vocal Literature I (3 Credits)
An intensive study of solo vocal literature from its origin to the present.
Prerequisite: MUSC443; or students who have taken courses with comparable content may contact the department.

MUSC644 Seminar in Solo Vocal Literature II (3 Credits)
A continuation of MUSC 643 with an emphasis on areas of individual interest.
Prerequisite: MUSC643; or students who have taken courses with comparable content may contact the department.

MUSC645 Seminar in Vocal Pedagogy (3 Credits)
A study of the physiological, psychological and acoustical aspects of the teaching of singing combined with independent study and research in areas of individual interest.
Prerequisite: MUSC400; or students who have taken courses with comparable content may contact the department.

MUSC646 Introduction to Musicology (3 Credits)
An introduction to the basics of musicological research, including sources, methodologies, and techniques, as well as the fundamentals of both academic and non-academic writing.
Prerequisite: Graduate student standing in in the School of Music.
Credit Only Granted for: MUSC648 or MUSC646.

MUSC648 Seminar in Music Research (3 Credits)
An introduction to graduate study in the history and literature of music. Bibliography and methodology of systematic and historical musicology.
Prerequisite: MUSC331.

MUSC649 Ensemble (1 Credit)
Repeatable to: 36 credits if content differs.

MUSC651 The Theories of Heinrich Schenker (3 Credits)
The analytical methods of Heinrich Schenker with application of those theories to musical literature from the Baroque, Classical and Romantic periods.
Prerequisite: MUSC450; or permission of ARHU-School of Music department.

MUSC653 Jazz Improvisation I (3 Credits)
Study of improvisational techniques and historical styles of jazz, including study of jazz "language" through transcription and analysis of recorded solos, and the exploration of creative processes and philosophical concepts.
Restriction: Permission of ARHU-School of Music department.
Credit Only Granted for: MUSC653 or MUSC699Z.
Formerly: MUSC699Z.

MUSC654 Jazz Improvisation II (3 Credits)
Continuation of MUSC653, study of jazz improvisation techniques through analysis, transcription and composition.
Prerequisite: MUSC653.
Restriction: Permission of ARHU-School of Music department.
Credit Only Granted for: MUSC654 or MUSC699Z.
Formerly: MUSC699Z.

MUSC655 Theory of Jazz (3 Credits)
Analysis of jazz harmony, with emphasis on principles of substitution, reharmonization, and syntax. Topics may also include chord/scale relationships, phrasing, articulation, notation and orchestration.
Restriction: Permission of ARHU-School of Music department.
Credit Only Granted for: MUSC655 ir MUSC699J.
Formerly: MUSC699J.

MUSC656 Jazz Arranging (3 Credits)
Comprehensive approach to jazz arranging, including chord scale theory, voicing techniques, part and score layout, and formal construction of an arrangement.
Prerequisite: MUSC655.
Restriction: Permission of ARHU-School of Music department.
Credit Only Granted for: MUSC656 or MUSC699N.
Formerly: MUSC699N.

MUSC658 Seminar in Advanced Analysis (3 Credits)
Individual analytical projects including computer music, non-western music and advanced Schenkerian analysis. Readings regarding form, structure and analytical methods.
Prerequisite: MUSC651, MUSC451, and MUSC471; or permission of ARHU-School of Music department.
Repeatable to: 6 credits if content differs.

MUSC659 Seminar in Repertoire and Pedagogy (2-3 Credits)
Analysis and preparation of choral master works from all major style periods for the purpose of successful rehearsal and performance by conductors.
Restriction: Permission of ARHU-School of Music department.
Credit Only Granted for: MUSC659 or MUSC699R.
Formerly: MUSC699R.

MUSC660 String Pedagogy (3 Credits)
A study of major string pedagogical treatises, and an evaluation of string pedagogical techniques, materials, and procedures.
Restriction: Permission of ARHU-School of Music department.
Credit Only Granted for: MUSC400S or MUSC660.

MUSC661 Theory and Analysis of Atonal and Twelve-Tone Music (3 Credits)
An introduction to the advanced theoretical literature in atonal and twelve-tone music with an emphasis on analytical applications to music by prominent 20th-century composers.
Prerequisite: MUSC450; or permission of ARHU-School of Music department. Jointly offered with MUSC461.
Credit Only Granted for: MUSC461 or MUSC661.

MUSC665 Theory in Analysis (3 Credits)
An advanced study of the philosophy, practice, and aesthetics of music analysis in contemporary music thoery. Readings drawn from the theoretic literature from 1960 to the present emphasize standards for discourse, the objects of music analysis, rationales for interpretation, and the role that theories of musical structure play in analytic practice.
Prerequisite: MUSC445; or permission of ARHU-School of Music department.
Restriction: Must not have completed MUSC465.
Credit Only Granted for: MUSC465, MUSC665, or MUSC699T.
Formerly: MUSC699T.

MUSC669 Orchestral Excerpts for String Players (1 Credit)
In-depth study of the orchestral excerpts required for professional orchestra auditions.
Restriction: Permission of ARHU-School of Music department.
Repeatable to: 6 credits.
Credit Only Granted for: MUSC669, MUSC699B, MUSC699L, MUSC699Q, or MUSC699X.
Formerly: MUSC699B,MUSC699L,MUSC699Q,and MUSC699X.

MUSC670 Interpreting Tonal Music: Analytical Tools, Techniques, and Perspectives (3 Credits)
Analytical tools, techniques, and perspectives for interpreting tonal music. Musical materials for analysis will predominantly be European music from about 1775 through 1900, supplemented with other tonal music genres, primarily those from the African American tradition.
Prerequisite: MUSC451 or equivalent; or permission of ARHU-School of Music.

MUSC671 Advanced Analytical Techniques II (3 Credits)
Analysis of representative masterpieces of the nineteenth and early twentieth centuries.
Prerequisite: MUSC451; or permission of ARHU-School of Music department.

MUSC672 Masterworks of the 20th Century: 1900-1950 (3 Credits)
A comprehensive survey of Western Art-Music of the first half of the 20th Century with a more intensive study and analysis of composers who have had a profound influence in the development of compositional practice in the modern era.
Restriction: Permission of ARHU-School of Music department; and must not have completed MUSC470.
Credit Only Granted for: MUSC448M, MUSC470, MUSC672, or MUSC699M.
Formerly: MUSC699M.

MUSC673 Style Analysis (3 Credits)
An analytical study of musical style from the Middle Ages to present through analysis of selected compositions. The principle genres and composers of Medieval, Renaissance, Baroque, Classical, Romantic and 20th century music will be covered.
Prerequisite: MUSC251; and permission of ARHU-School of Music department.
Restriction: Must not have completed MUSC448.
Credit Only Granted for: MUSC673, MUSC448F, or MUSC699F.
Formerly: MUSC699F.

MUSC674 Critical Concepts in Music Theory (3 Credits)
This seminar excavates and rebuilds some foundational concepts in music theory from a research perspective. Over the course of the term we will probe, problematize, enrich, and reconstruct our understanding of critical concepts such as pitch, timbre, texture, interval, scale, tonic, key, harmonic function, music analysis, meter, cadence, phrase, and form as these are deconstructed and recreated at a research level by contemporary music theorists. This advanced readings course is designed for the inquisitive student who is prepared to engage in sustained, thoughtful, and lively discussion of ideas often presumed as basic knowledge.
Restriction: Permission of the School of Music; and permission of instructor.
Credit Only Granted for: MUSC674 or MUSC699T.
Formerly: MUSC699T.

MUSC675 Music Theory Pedagogy (3 Credits)
Analysis of introductory level music theory courses, evaluation of text materials, and teaching approaches for music fundamentals, aural training, and basic undergraduate theory programs.

MUSC677 Introduction to Ethnomusicology (3 Credits)
An introduction to the field of ethnomusicology: its origins as comparative musicology, its establishment as an autonomous discipline, and its contemporary trajectories.
Restriction: Permission of ARHU-School of Music department.

MUSC678 Seminar in Musical Composition (3 Credits)
An advanced course in musical composition. May be repeated for credit.

MUSC679 Seminar in Ethnomusicology (3 Credits)
Seminar topics address current issues, including gender, the social economy of music, ethnography of performance, etc.
Repeatable to: 9 credits if content differs.
Formerly: MUET679.

MUSC684 Seminar in Music of the Romantic Era (3 Credits)
Seminar in music of the Romantic era. Research topics in music from 1820 to 1900.

MUSC685 Seminar in Music of the 20th Century (3 Credits)
Seminar in music of the twentieth century. Research topics in music from 1900 to the present.

MUSC688 Advanced Orchestration (3 Credits)
Orchestration projects in the styles of Debussy, Ravel, Stravinsky, Schoenberg, Bartok, and others.
Prerequisite: MUSC487; or students who have taken courses with comparable content may contact the department.
Additional Information: May be repeated once for credit.

MUSC689 Advanced Conducting (2 Credits)
A concentrated study of the conducting techniques involved in the repertoire of all historical periods.
Prerequisite: MUSC491; or students who have taken courses with comparable content may contact the department.
Additional Information: May be repeated for credit with permission of instructor.

MUSC698 Advanced Seminar in Ethnomusicology (3 Credits)
Advanced Seminar on topics that change every semester. Requires well-developed skills in musical and social analysis, mastery of theories and methods of ethnomusicology.
Prerequisite: Permission of ARHU-School of Music department.
Restriction: Permission of ARHU-School of Music department.
Repeatable to: 9 credits if content differs.
Credit Only Granted for: MUET689 or MUSC698.
Formerly: MUET689.

MUSC699 Selected Topics in Music (1-3 Credits)
Restriction: Permission of ARHU-School of Music department.
Repeatable to: 6 credits if content differs.

MUSC757 Aural Skills for Conductors (1 Credit)
Advanced musicianship skills necessary for conductors.
Restriction: Permission of ARHU-School of Music department.

MUSC758 Advanced Aural Skills for Conductors (1 Credit)
Continuation of MUSC757, advanced aural skills necessary for conductors.
Prerequisite: MUSC757.
Restriction: Permission of ARHU-School of Music department.
Repeatable to: 4 credits.

MUSC799 Master's Thesis Research (1-6 Credits)

MUSC800 Advanced Seminar in Music Pedagogy (3 Credits)
A detailed study of historical and contemporary methods of pedagogy, and analysis of pedagogical problems. Sectioning by instrument. Required of all candidates for the D.M.A. Degree in performance and literature.
Prerequisite: MUSC400; or students who have taken courses with comparable content may contact the department.
Restriction: Permission of instructor.

MUSC801 Advanced Seminar in Music Pedagogy (3 Credits)
A detailed study of historical and contemporary methods of pedagogy, and analysis of pedagogical problems. Sectioning by instrument. Required of all candidates for the D.M.A. Degree in performance and literature.
Prerequisite: MUSC400; or students who have taken courses with comparable content may contact the department.
Restriction: Permission of instructor.

MUSC802 Advanced Seminar in Music Pedagogy III (3 Credits)
A detailed study of historical and contemporary methods of pedagogy, and analysis of pedagogical problems. Sectioning by instrument.
Prerequisite: MUSC801.
Restriction: Permission of ARHU-School of Music department.

MUSC811 Doctoral Opera Techniques (2 Credits)
Techniques for opera performance: Improvisation; Acting I, Scene Study I; and Movement I. Practical application of styles, techniques to operat e repertoire, and methodology seminar.
Restriction: Permission of ARHU-School of Music department.
Credit Only Granted for: MUSC611 or MUSC811.

MUSC812 Doctoral Opera Techniques II (2 Credits)
Continuation of MUSC811. Techniques for opera preformance: Scene Study II; Acting II; Movement II: Stage Combat I; and Mask; and methodology seminar.
Prerequisite: MUSC811; and permission of ARHU-School of Music department.
Credit Only Granted for: MUSC612 or MUSC812.

MUSC813 Doctoral Opera Techniques III (2 Credits)
Continuation of MUSC812. Techniques for opera performance: Scene Study III; Movement III; Acting III Shakespeare; Dance I; Stage Combat II; Stage Combat II; and methodology seminar.
Prerequisite: MUSC812; and permission of ARHU-School of Music department.
Credit Only Granted for: MUSC613 and MUSC813.

MUSC814 Doctoral Opera Techniques IV (2 Credits)
Continuation of MUSC813. Techniques for opera performance: Scene Study IV; Dance II; Movement IV; and methodology seminar.
Prerequisite: MUSC813; and permission of ARHU-School of Music department.
Credit Only Granted for: MUSC614 or MUSC814.

MUSC830 Doctoral Seminar in Music Literature (3 Credits)
An analytical survey of the literature of music: keyboard music; vocal music; string music; wind instrument music; required of all candidates for the D.M.A. Degree in literature-performance.
Prerequisite: Must have completed at least twelve hours in music history and literature.

MUSC831 Doctoral Seminar in Music Literature (3 Credits)
An analytical survey of the literature of music: keyboard music; vocal music; string music; wind instrument music. Required of all candidates for the D.M.A. Degree in literature-performance.
Prerequisite: MUSC830; or permission of ARHU-School of Music department.

MUSC832 Doctoral Seminar in Music Literature (3 Credits)
An analytical survey of the literature of music: keyboard music; vocal music; string music; wind instrument music.
Prerequisite: MUSC831.
Restriction: Permission of ARHU-School of Music department.

MUSC878 Advanced Composition (3 Credits)
Conference course in composition in the larger forms.
Prerequisite: MUSC678; or students who have taken courses with comparable content may contact the department.
Restriction: Permission of instructor.
Repeatable to: 99 credits.

MUSC898 Pre-Candidacy Research (1-8 Credits)

MUSC899 Doctoral Dissertation Research (1-8 Credits)

MUSP - Music Performance

MUSP402 Music Performance (2 Credits)
Senior course, in the minor series.

MUSP403 Music Performance (2 Credits)
Senior course, in the minor series.

MUSP409 Music Performance (2-4 Credits)
Senior course in the principal series.

MUSP410 Music Performance (2-4 Credits)
Senior course in the principal series. Recital required.

MUSP419 Music Performance (2-4 Credits)
Senior course in the major series.

MUSP420 Senior Recital (4 Credits)
Senior course in the major series. Recital required.

MUSP609 Interpretation and Repertoire (2 Credits)
Restriction: Permission of ARHU-School of Music department; and must have graduate standing in performance in the principal series.

MUSP610 Graduate Music Performance (4 Credits)
Prerequisite: MUSP609.
Restriction: Permission of ARHU-School of Music department.

MUSP619 Interpretation and Repertoire (2-4 Credits)
Prerequisite: departmental audition and permission of Department Chairman. Repeatable to a maximum of 12 credits.
Restriction: Must complete a Departmental audition; and permission of ARHU-School of Music department.

MUSP620 Graduate Music Performance (4 Credits)
Prerequisite: MUSP 619 and permission of Department Chairman. Recital course in the major series.
Prerequisite: MUSP619.
Restriction: Permission of ARHU-School of Music department.

MUSP621 Interpretation, Repertoire, and Performance (2-4 Credits)
Private music instruction in preparation for public performance.
Prerequisite: MUSP619.
Corequisite: MUSC758.
Restriction: Permission of ARHU-School of Music department.

MUSP679 Practicum (1 Credit)
Private individual instruction on a secondary instrument.
Restriction: Permission of ARHU-School of Music department.
Repeatable to: 4 credits.

MUSP719 Interpretation and Repertoire (2-4 Credits)
Prerequisite: departmental audition, admission to doctoral program in the major series and permission of department chairman. Repeatable to a maximum of 12 credits.
Restriction: Must complete a Departmental audition; and must be in the doctoral program in the major series; and permission of ARHU-School of Music department.

MUSP815 Interpretation, Performance, and Pedagogy (4 Credits)
A seminar in pedagogy and the pedagogical literature for the doctoral performer, with advanced instruction at the instrument, covering appropriate compositions. Required of all candidates for the D.M.A. Degree in literature-performance. Prerequisite: doctoral standing in performance and permission of department chairman. Recital course.
Restriction: Must have Doctoral standing in performance; and permission of ARHU-School of Music department.

MUSP816 Interpretation, Performance, and Pedagogy (4 Credits)
Recital course. Prerequisite: MUSP 815 and permission of Department Chairman.
Prerequisite: MUSP815.
Restriction: Permission of ARHU-School of Music department.

MUSP817 Interpretation, Performance, and Pedagogy (4 Credits)
Recital course. Prerequisite: MUSP 816 and permission of Department Chairman.
Prerequisite: MUSP816.
Restriction: Permission of ARHU-School of Music department.

MUSP898 Pre-Candidacy Research (1-8 Credits)

MUSP899 Doctoral Dissertation Research (1-8 Credits)

NACS - Neuroscience & Cognitive Science

NACS600 Ethics in Scientific Research (2 Credits)
Issues of scientific integrity with emphasis on investigators in the laboratory sciences, including mentoring, scientific record keeping, authorship and peer review, ownership of data, use of animals and humans in research, and conflict of interest.
Prerequisite: Must have completed a year of graduate study.
Restriction: Permission of instructor; and must be in Neurosciences and Cognitive Sciences (Doctoral) program.
Credit Only Granted for: NACS600, PSYC788B, or BIOL600.

NACS608 Neuroscience and Cognitive Science Seminar (1 Credit)
Special seminar topics in Neuroscience and Cognitive Science.
Restriction: Permission of instructor.
Repeatable to: 8 credits if content differs.

NACS640 Foundational Readings Seminar (2 Credits)
An introduction to the breadth of research in Neuroscience and Cognitive Science. Faculty will present papers to provide historical context and introduction to important issues in the fields of their research.
Restriction: Permission of instructor; and must be in Neurosciences and Cognitive Sciences (Doctoral) program.
Credit Only Granted for: NACS640 or NACS728R.
Formerly: NACS728R.

NACS641 Introduction to Neurosciences (4 Credits)
Detailed examination of neurophysiology and sensorimotor systems.
Restriction: Permission of instructor.

NACS642 Cognitive Neuroscience (4 Credits)
A study of the fundamental concepts and techniques of cognitive neuroscience. Hands-on experience with three critically different cognitive neuroscience methods: EEG, MEG, and fMRI.

NACS643 Computational Neuroscience (4 Credits)
Provides a mathematical foundation in computational neuroscience.
Prerequisite: NACS641; and must have completed a course in calculus; and permission of instructor.

NACS644 Cellular and Molecular Neuroscience (4 Credits)
Overview of insights into the molecular mechanisms underlying the structure and function of the nervous system.
Prerequisite: NACS641; or permission of instructor.

NACS645 Cognitive Science (4 Credits)
A study of mental representations and computations. Issues examined include computation, representations, decisions, modularity, evolution, innateness, and reductionism.
Credit Only Granted for: NACS645 or NACS728Y.
Formerly: NACS728Y.

NACS728 Selected Topics in Neuroscience and Cognitive Science (2-4 Credits)
Graduate seminar on selected topics in contemporary neuroscience and Cognitive science. Extensive readings from the primary literature. Topics vary by semester.
Restriction: Permission of BSOS-Dean-Neuroscience and Cognitive Science.
Repeatable to: 15 credits if content differs.

NACS798 Master's Non-Thesis Research (1-3 Credits)
Individual research course for NACS non-thesis MS degree
Restriction: Must be in Neurosciences and Cognitive Sciences (Doctoral) program.
Repeatable to: 6 credits.

NACS799 Master's Thesis Research (1-3 Credits)
Individualized research course for NACS thesis MS degree
Restriction: Must be in Neurosciences and Cognitive Sciences (Doctoral) program.
Repeatable to: 6 credits.

NACS898 Pre-Candidacy Research (1-8 Credits)

NACS899 Doctoral Dissertation Research (1-8 Credits)
Indivdual instruction course: contact department or instructor to obtain section number
Restriction: Must be in Neurosciences and Cognitive Sciences (Doctoral) program.

NAVY - Navy

NAVY400 Naval Operations and Seamanship (3 Credits)
Capstone course for senior NROTC Navy-option midshipmen in advanced navigation, communications, naval operations, and naval warfare. Students learn through simulation in a computer classroom known as the Maritime Skills Simulator (MSS), in addition to lectures, discussions, and qualitative and quantitative tests/examinations. Students will engage in discussions regarding the moral and ethical responsibilities or military leaders, as well as the essential attributes of character required for effective leadership.
Recommended: NAVY201.
Restriction: Permission of UGST-Navy ROTC.
Additional Information: Priority enrollment will be given to students enrolled in the NROTC program.

NAVY401 Leadership and Ethics (3 Credits)
Integrates an intellectual exploration of Western moral traditions and ethical philosophy with military leadership, core values, the Uniform Code of Military Justice, and Navy regulations. The course provides students with a basic understanding of major moral traditions including Relativism, Utilitarianism, Kantian Ethics, Natural Law Theory, Divine Command Theory, and Virtue Ethics.
Recommended: NAVY200.
Restriction: Permission of UGST-Navy ROTC.
Additional Information: Priority enrollment will be given to students enrolled in the NROTC program.

NAVY402 Fundamentals of Maneuver Warfare (3 Credits)
A detailed study of the characteristics of modern warfare and their interactions with maneuver warfare doctrine, with a focus on the United States Marine Corps. Throughout the course, there is a strong focus on leadership, as the fundamental purpose of this course is to develop the skills, knowledge, leadership background and mentality necessary for a successful future leadership and service, whether in the military or the civilian sector.
Recommended: NAVY100, NAVY101, NAVY200, and NAVY108.
Restriction: Permission of UGST-Navy ROTC.
Additional Information: Priority in enrollment will be given to students in the NROTC program.

NFSC - Nutrition and Food Science

NFSC412 Food Processing Technology (4 Credits)
Provides in-depth study of the major industrial modes of food preservation. It integrates aspects of the biology, microbiology, biochemistry and engineering disciplines as they relate to food processing technology and food science.
Prerequisite: CHEM241, CHEM242, NFSC431, NFSC414, and NFSC434.
Corequisite: NFSC421 and NFSC423.
Recommended: MATH120; or completion of MATH220 recommended.

NFSC414 Mechanics of Food Processing (4 Credits)
Applications in the processing and preservation of foods, of power transmission, hydraulics, electricity, thermodynamics, refrigeration, instruments and controls, materials handling and time and motion analysis.
Prerequisite: PHYS121.
Credit Only Granted for: ENBE414 or NFSC414.
Formerly: ENBE414.

NFSC416 Food Safety System (2 Credits)
Focuses on identifying and reducing biological, chemical and physical risks in food manufacturing and thereby reduce outbreak incidences and improve public health. The course is based on the US FDA recognized curriculum on 'Hazard Analysis and Risk Based Preventive Controls' (HARPC) regulations for manufacturing human foods. A successful completion of this course will result in students becoming 'preventive controls qualified individuals' as defined by the US FDA.
Restriction: Permission of AGNR-Nutrition and Food Science department.
Repeatable to: 0 credit.
Credit Only Granted for: NFSC498T, NFSC416, NFSC679T, or NFSC616.
Formerly: NFSC498T.

NFSC420 Nutritional Biochemistry (4 Credits)
This is a comprehensive course that integrates aspects of biochemistry, nutrition, and molecular biology. This course deals with (1) structure and function of biochemical macromolecules including carbohydrates, proteins, lipids, and nucleic acids; (2) transcriptional and translational regulation focusing on how gene expression is controlled at the level of transcription and translation, particularly in response to nutritional factors; (3) nutritional principles covering impact of digestion and absorption; (4) biochemical metabolism on emphasis of how the body processes nutrients and how metabolic pathways are regulated.
Prerequisite: NFSC315 and BCHM461.

NFSC421 Food Chemistry (3 Credits)
Basic chemical and physical concepts are applied to the composition and properties of foods. Emphasis on the relationship of processing technology to the keeping quality, nutritional value, and acceptability of foods.
Prerequisite: BCHM461.

NFSC422 Food Product Research and Development (3 Credits)
A capstone course for FDSC majors. A study of the research and development of new food products. Application of food technology, engineering, safety and packaging are integrated by teams of students to develop a new food product from concept to pilot plant scale-up. Students will travel to nearby food processing plants on two to four Saturdays during the semester.
Restriction: Senior standing; and must be in a major within AGNR-Nutrition and Food Science department; and permission of AGNR-Nutrition and Food Science department.
Formerly: FDSC422.

NFSC423 Food Chemistry Laboratory (3 Credits)
Analysis of the major and minor constituents of food using chemical, physical and instrumental methods in concordance with current food industry and regulatory practices. Laboratory exercises coincide with lecture subjects in NFSC421.
Prerequisite: Must have completed or be concurrently enrolled in NFSC421.

NFSC426 Current Topics in Nutrition and Chronic Disease (3 Credits)
Analysis of current topics related to diet, nutrition, and human health at cellular, molecular and biochemical level. Further, this course will provide overview of the current methods, and in vitro and in vivo model systems used in nutrition research. Syllabus includes topics relevant to dietary regulation of genes/proteins and their impact on both physiological and pathological conditions including hyperlipidemia, hyperglycemia, fibrosis, food allergy, nutraceuticals, inflammatory diseases (IBD), cardiovascular diseases (atherosclerosis and stenosis), and oncogenesis. This course is designed to help students to understand and apply current scientific concepts and research methods, and to obtain necessary skills in evaluation and interpretation of evidence based scientific data.
Jointly offered with: NFSC621.
Credit Only Granted for: NFSC498F, NFSC426, NFSC678F, or NFSC621.
Formerly: NFSC498F.

NFSC427 Current Topics on Diet, Gut Microbiota Health and Metabolic Disease (3 Credits)
A review of current science linking the gut microbiota/microbiome with general and public health. It covers the composition of a healthy gut microbiota, its acquisition, how it is studied and analyzed; Gut microbiota changes with diet, specific foods, immigration and globalization and exercise; Its links to obesity, liver disease, insulin resistance and diabetes and cardiovascular disease; Links to the immune system; Targeting the gut microbiota composition and function to protect against or treat metabolic diseases. This course will be of use to public health and health care professionals, Food and/or Nutrition scientists, Dieticians, and those generally interested in understanding the health relevance of news reports or scientific reports on the microbiome.
Recommended: BCHM461.
Jointly offered with: NFSC627.
Credit Only Granted for: NFSC678K, NFSC498K, NFSC427, or NFSC627.
Formerly: NFSC498K.

NFSC430 Food Microbiology (3 Credits)
A study of microorganisms of major importance to the food industry with emphasis on food-borne outbreaks, public health significance, bioprocessing of foods, disease control, and the microbial spoilage of foods.
Prerequisite: BSCI223; or permission of instructor.
Credit Only Granted for: ANSC430 or NFSC430.
Formerly: FDSC430.

NFSC431 Food Quality Control (4 Credits)
Definition and organization of the quality control function in the food industry; preparation of specifications; statistical methods for acceptance sampling; in-plant and processed product inspection. Instrumental and sensory methods for evaluating sensory quality, identity and wholesomeness and their integration into grades and standards of quality. Statistical Process Control (SPC).

NFSC434 Food Microbiology Laboratory (3 Credits)
A study of techniques and procedures used in the microbiological examination of foods.
Prerequisite: Must have completed or be concurrently enrolled in NFSC430.
Credit Only Granted for: NFSC434 or ANSC434.
Formerly: FDSC434.

NFSC436 Diet and Optimal Human Health (3 Credits)
Focuses on maintaining optimal health and preventing diseases in humans with attention to diet. Reviews the main causes (nutritional/behavioral/lifestyle/ environmental/genetic factors) of diseases and nutrient needs, sources, functions and interactions, and deals with the benefits of healthy diets and nutraceutical/pharmaceutical option on human health. The emphasis will be on developing conceptual knowledge, critical thinking and problem solving skills and the application of nutrition in the health promotion.
Prerequisite: NFSC100, BSCI170, and BSCI171 .
Jointly offered with: NFSC636.
Credit Only Granted for: NFSC498L, NFSC678L, NFSC436, or NFSC636.
Formerly: NFSC498L.

NFSC440 Advanced Human Nutrition (4 Credits)
A critical study of physiologic, molecular and metabolic influences on utilization of carbohydrates, lipids, proteins, vitamins, macro-and micro-minerals, and nonnutritive components of food. Interactions of these nutrients and food components will be examined relative to maintaining health.
Prerequisite: Minimum of C- in NFSC100, BCHM462 and BSCI440.

NFSC450 Food and Nutrient Analysis (3 Credits)
Methods and practices of the analysis of foods and nutrients. An overview of the principles and basic mechanisms used in many of the analytical procedures commonly used in food and nutrition research. Emphasis will be placed on hands-on development of skills necessary to complete each analytical procedure; and on the accurate and concise description of the methodology and results from their application and on the regulations governing food analysis for nutritional labeling.
Prerequisite: BCHM461 and NFSC100.
Formerly: NUTR450.

NFSC455 Medical Nutrition Therapy I (4 Credits)
Advanced clinical nutrition course for dietetics or nutrition science majors. Modifications of the normal adequate diet to meet human nutritional needs in acute and chronic diseases and metabolic disorders. Includes energy balance and weight management, nutritional genomics, nutrition counseling, autoimmune disease, nutrition for pediatric conditions.
Prerequisite: NFSC380.
Corequisite: NFSC440.

NFSC456 Medical Nutrition Therapy II (4 Credits)
Modifications of the normal adequate diet to meet human nutritional needs in acute and chronic diseases and metabolic disorders.
Prerequisite: Minimum of C- in NFSC380 and NFSC440; and permission of AGNR-Nutrition and Food Science department.

NFSC470 Community Nutrition (3 Credits)
Perspectives underlying the practice of nutrition services in community settings. Assessment of needs, program planning and evaluation. Programs and strategies to meet nutrition needs outside the acute care setting, such as nutrition education and food assistance. National nutrition policy and federal initiatives in nutrition will be examined. Students will be required to travel to local community nutrition sites during the semester.
Prerequisite: Minimum of C- in NFSC315.

NFSC490 Special Problems in Nutrition (2-3 Credits)
Individually selected problems in the area of human nutrition.
Prerequisite: NFSC440; and permission of AGNR-Nutrition and Food Science department.

NFSC491 Professional Issues and Opportunities in Dietetics (3 Credits)
A capstone course for dietetics majors. Students will integrate knowledge and theory of nutrition, food, management, psychology, and social behaviors necessary to support quality dietetic practice. Working in teams, students will participate in case studies, simulated situations and community projects. Individuals and groups will present cases as well as papers on published research.
Prerequisite: Minimum of C- in NFSC350 and permission of Nutrition and Food Science Dietetics program.
Corequisite: NFSC456.
Restriction: Senior standing or higher; and must be in Nutrition and Food Science: Dietetics program.

NFSC498 Selected Topics (1-3 Credits)
Selected current aspects of food.
Restriction: Permission of AGNR-Nutrition and Food Science department.
Repeatable to: 6 credits if content differs.

NFSC612 Advanced Food Processing Technology (4 Credits)
Food Processing covers background of food processing and maintenance of nutritive quality. Lecture classes dealing with the principles of science and engineering rationale of various food additives and processing systems and their unit operations. Chemical, physical, and microbiological characteristics of the products will be discussed in relationship to processing variables. Methods of quality control, assurance of product standards, calculation of process variables, including ingredient formulation, formula adjustments, and product yield will be covered. Concluding lectures will cover management approaches to assuring efficiency of energy usage, quality maintenance, and product safety in the processing, distribution, and marketing of food products.
Repeatable to: 6 credits if content differs.
Credit Only Granted for: NFSC679F or NFSC612.
Formerly: NFSC679F.

NFSC620 Diet and Cancer Prevention (3 Credits)
1. The nature of cancer and the relationship between dietary/nutritional factors and incidence of cancer 2. Basic concepts of general cancer biology with focus on effects of dietary components on genes and their encoded proteins, epigenetic changes and cell signaling 3. Effect of dietary factors in various types of cancer with respect to the benefit of intervention strategies for chemoprevention 4. Scientific knowledge, critical thinking, and the practical application of diet in cancer prevention.
Prerequisite: NFSC440; or permission of instructor.
Credit Only Granted for: NFSC620 or NFSC679D.
Formerly: NFSC678D.

NFSC624 Advanced Research Design and Methods in Nutrition Education (3 Credits)
Health promotion and nutrition education are parts of behavioral and social science that can be used to promote health and prevent diet-related diseases. Their purpose is to positively influence the health-related behaviors of individuals, communities, surrounding environments, and policies. The major goals of this course are to help students understand fundamental behavioral and social models and theories used in the field of community nutrition and to address methodological issues in developing, implementing, and evaluating nutrition education programs.
Prerequisite: One statistics course; or permission by the instructor.
Credit Only Granted for: NFSC678V, NFSC498V, or NFSC624.
Formerly: NFSC678V.

NFSC627 Advanced Current Topics on Diet, Gut Microbiota Health and Metabolic Disease (3 Credits)
A review of current science on links between the gut microbiota and general and public health. It covers the composition of a healthy gut microbiota, its acquisition, how it is studied and analyzed; Gut microbiota changes with diet, specific foods, immigration and globalization and exercise; Its links to obesity, liver disease, insulin resistance and diabetes and cardiovascular disease; Links to the immune system; Targeting the gut microbiota in preventing and treating metabolic disease obesity and related diseases; How the gut microbiota changes with immigration and globalization. This course will be of use to public health and health care professionals, Food and/or Nutrition scientists, Dieticians, and those generally interested in understanding the health relevance of news reports or scientific reports on the microbiome.
Recommended: BCHM461 .
Jointly offered with: NFSC427.
Credit Only Granted for: NFSC678K, NFSC498K, NFSC427, or NFSC627.
Formerly: NFSC678K.

NFSC631 Advanced Food Microbiology (3 Credits)
One lecture and one laboratory period a week. An in-depth understanding and working knowledge of a selected number of problem areas and contemporary topics in food microbiology.
Prerequisite: NFSC430.
Restriction: Permission of instructor.

NFSC633 Food Polymer Science (3 Credits)
Food polymers including protein and carbohydrate from food, and their chemical, physical, and functional properties together with their structure-function relationship will be discussed. Food polymer applications in food and non-food areas will be covered. Principles and applications of instrumental methods for polymer characterization will be introduced. An emphasis on nanotechnology and its application to design and characterization food polymers will be included.
Prerequisite: Permission of instructor.
Credit Only Granted for: NFSC633 or NFSC679P.
Formerly: NFSC679P.

NFSC636 Advanced Diet and Optimal Human Health (3 Credits)
Focuses on maintaining optimal health and preventing diseases in humans with attention to diet. Reviews main causes (nutritional/behavioral/lifestyle/ environmental/genetic factors) of diseases and nutrient needs, sources, functions and interactions, and deals with the benefits of healthy diet and nutraceutical/pharmaceutical option on human health. The emphasis will be on developing conceptual knowledge, critical thinking and problem solving skills and the application of nutrition in the health promotion.
Prerequisite: NFSC100, BSCI170, and BSCI171 .
Jointly offered with: NFSC436.
Credit Only Granted for: NFSC498L, NFSC678L, NFSC436, or NFSC636.
Formerly: NFSC678L.

NFSC641 Advanced Fermented Food, Feed, and Pharmaceuticals (3 Credits)
Provides an in-depth exploration of fermentation as both a biochemical process and a biotechnology tool for food, feed, and pharmaceutical production. Students will critically analyze the microbiology, metabolic pathways, and process engineering principles underlying the fermentation of diverse substrates. Emphasis will be placed on the selection, characterization, and optimization of microbial starter cultures used in the production of probiotic-rich and functional foods.
Prerequisite: AGST130; CHEM131/271; or by Permission.
Jointly offered with: NFSC341.

NFSC650 Nutrition and Public Health (2 Credits)
Overview of the major policy debates involving nutrition and health in the U.S. Public Health System associated with nutrition, chronic disease and nutrition lifestyle stages will be discussed. The CDCynergy software program will facilitate the development of program design, implementation and evaluation skills.
Prerequisite: NFSC470.
Restriction: Permission of AGNR-Nutrition and Food Science department.

NFSC660 Research Methods (3 Credits)
A study of appropriate research methodology and theories including experimental design. Each student is required to develop a specimen research proposal.
Prerequisite: Must have completed one statistics course.
Formerly: NUTR 660.

NFSC678 Selected Topics in Nutrition (1-6 Credits)
Individual or group study in an area of nutrition.
Repeatable to: 6 credits.
Formerly: NUTR678.

NFSC679 Selected Topics in Food Science (1-6 Credits)
Individual or group study in an area of food science.
Repeatable to: 6 credits if content differs.

NFSC680 Human Nutritional Status (3 Credits)
Indirect and direct methods of appraisal of human nutritional status which include: dietary, anthropometric, clinical evaluations and biochemical measures.
Prerequisite: Must have complete coursework in advanced nutrition, biochemistry and physiology.

NFSC688 Seminar in Nutrition and Food Science (1-3 Credits)
This is a seminar course presentedy by NFSC graduate students and invited speakers in the field of nutrition and food science.
Restriction: Must be in a major within AGNR-Nutrition and Food Science department.
Repeatable to: 3 credits.
Formerly: NUTR688.

NFSC690 Nutrition and Aging (3 Credits)
Examine the physiological, social and psychological changes that may occur with aging and their impact on nutritional status and on successful aging.
Prerequisite: NFSC440 or BSCI440; or students who have taken courses with comparable content may contact the department.

NFSC698 Colloquium in Food Science (1 Credit)
Oral reports on special topics or recently published research in food science and technology. Distinguished scientists are invited as guest lecturers. A maximum of three credits allowed for the M.S.
Formerly: FDSC698.

NFSC699 Problems in Nutrition and Food Science (1-4 Credits)
Credit according to time scheduled and magnitude of problem. An experimental program on a topic other than the student's thesis problem will be conducted. Four credits shall be the maximum allowed toward an advanced degree.
Restriction: Permission of AGNR-Nutrition and Food Science department.
Formerly: FDSC 699 and NUTR 699.

NFSC735 Food Toxicology (3 Credits)
An introduction to basic concepts in toxicology in relation to toxic food contaminants and additives; both synthetic and naturally occurring. Focus on exposure routes, molecular targets and susceptible individuals. Also includes regulatory toxicology with respect food toxins.
Recommended: BCHM462, BSCI440, or CHEM131. Cross-listed with MIEH735.
Credit Only Granted for: MIEH735 or NFSC735.

NFSC799 Master's Thesis Research (1-6 Credits)
First and second semesters. Credit in proportion to work done and results accomplished. Investigation in some phases of foodservice administration which may form the basis of a thesis. results in the form of a thesis.
Formerly: FDSC 799, NUSC 799, and NUTR 799.

NFSC898 Pre-Candidacy Research (1-8 Credits)
First and second semesters. Oral reports on special topics or recently published research in nutrition. Distinguished scientists are invited as guest lecturers. A maximum of three credits allowed for the M.S.
Formerly: NUSC898.

NFSC899 Doctoral Dissertation Research (1-8 Credits)
Formerly: FDSC 899, NUSC 899, and NUTR 899.

PERS - Persian

PERS405 Media and the Current Issues in Iranian Society (6 Credits)
Develops Persian language proficiency and domain-specific knowledge at advanced-mid to advanced-high level on ACTFL scale. Enhances linguistic and cultural competence. Provides a broad understanding of some of the current social, political and economic issues in modern Iran. Taught in Persian.
Prerequisite: PERS306; or equivalent as determined by World Language Placement (WLP).

PERS406 Practicum in Persian Translation (6 Credits)
Provides opportunities for translation, interpretation, and analysis of various authentic oral and written texts (both English to Persian and Persian to English). Facilitates the development of Persian language proficiency at advanced level through a task-based approach that integrates all the language skills in pedagogical translation activities.
Prerequisite: PERS306; or equivalent as determined by the World Language Placement (WLP).

PERS411 Readings in Iranian Islam (3 Credits)
In-depth study of Iranian Islam via Islamic texts. Develops competency in speaking, reading, writing, and listening comprehension at advanced level. Taught in Persian.
Prerequisite: Permission of ARHU-School of Languages, Literatures, and Cultures department.

PERS498 Special Topics in Persian Studies (3 Credits)
Topic and language to be announced when offered.
Prerequisite: Permission of instructor.
Repeatable to: 9 credits if content differs.

PERS601 Modern Persian Literature (3 Credits)
Selected readings in Persian poetry, fiction and drama covering topics related to contemporary Iranian society and culture. In Persian.
Prerequisite: Permission of ARHU-School of Languages, Literatures, and Cultures department.

PERS611 Practicum in Translation and Interpreting (3 Credits)
Analysis, translation, and interpreting of literary, expository, and oral texts, mainly from English to Persian. Focus on interdependence of language, context and culture. In Persian and English.
Prerequisite: Permission of ARHU-School of Languages, Literatures, and Cultures department.

PERS632 Film and Popular Culture in the Persian-speaking World (3 Credits)
Study of socio-cultural, political and identity issues in the Persian-speaking world as seen through visual media, primarily film. In Persian.
Restriction: Must be in M.Prof.Studies: Persian (Master's) program; or must be in the Graduate Certificate of Professional Studies-Persian.
Additional Information: Please visit http://www.oes.umd.edu/index.php?slab=persian-language for more information.

PERS641 Iranian Media and International Relations (3 Credits)
Political interests and diplomatic positions of Iran in the contemporary international context as reflected in its print and electronic media. In Persian.
Prerequisite: Permission of ARHU-School of Languages, Literatures, and Cultures department.

PERS642 Political Issues in Contemporary Iran (3 Credits)
Analysis of current political context in Iran; impact of modernization and westernization. In Persian.
Restriction: Must be in M.Prof.Studies: Persian (Master's) program; or must be in the Graduate Certificate of Professional Studies-Persian.
Additional Information: Please visit http://www.oes.umd.edu/index.php?slab=persian-language for more information.

PERS662 Persian Sociolinguistics (3 Credits)
Study of impact of social and regional factors on spoken and written usage. In Persian.
Prerequisite: Permission of ARHU-School of Languages, Literatures, and Cultures department.

PERS672 Persian Culture and Commerce (3 Credits)
Major issues in Iranian business culture; relations between state and private sector; effects of globalization. In Persian.
Restriction: Must be in M.Prof.Studies: Persian (Master's) program; or must be in the Graduate Certificate of Professional Studies-Persian.
Additional Information: Please visit http://www.oes.umd.edu/index.php?slab=persian-language for more information.

PERS689 Special Topics in Persian Studies (3 Credits)
In-depth analysis of a particular aspect of Persian studies. In Persian.
Prerequisite: Permission of ARHU-School of Languages, Literatures, and Cultures department.
Repeatable to: 12 credits if content differs.

PHIL - Philosophy

PHIL408 Topics in Contemporary Philosophy (3 Credits)
An intensive examination of contemporary problems and issues. Source material will be selected from recent books and articles.
Repeatable to: 99 credits if content differs.

PHIL409 Advanced Studies in Contemporary Philosophy (3 Credits)
An in-depth study of a contemporary philosophical problem or issue. Topics will vary, but the course will encourage students to grapple with the primary literature in order to generate sustained critical analyses or proposed resolutions of issues under active consideration in contemporary philosophy.
Prerequisite: 6 credits in PHIL courses.
Repeatable to: 12 credits if content differs.

PHIL412 The Philosophy of Plato (3 Credits)
A critical study of selected dialogues.
Prerequisite: 6 credits in PHIL courses.

PHIL414 The Philosophy of Aristotle (3 Credits)
A critical study of selected portions of Aristotle's writings.
Prerequisite: 6 credits in PHIL courses.

PHIL417 The Golden Age of Jewish Philosophy (3 Credits)
Jewish philosophy from Maimonides in the 12th century to the expulsion of the Jews from Spain at the end of the 15th Century. Topics include the limitations of human knowledge, creation of the world, foreknowledge and free will, and the existence of God.
Prerequisite: 3 credits in PHIL courses; or permission of ARHU-Meyerhoff Program & Center for Jewish Studies; or permission of ARHU-Philosophy department.
Cross-listed with: JWST452.
Credit Only Granted for: JWST452 or PHIL417.

PHIL418 Topics in Epistemology/Metaphysics (3 Credits)
An intensive examination of contemporary problems and issues in epistemology or metaphysics. Source material will be selected from recent books and articles.
Prerequisite: 2 courses in PHIL.
Repeatable to: 12 credits if content differs.

PHIL428 Topics in the History of Philosophy (3 Credits)
Prerequisite: PHIL310 and PHIL320; or permission of ARHU-Philosophy department.
Repeatable to: 99 credits if content differs.

PHIL438 Topics in Value Theory (3 Credits)
An intensive examination of contemporary problems and issues in ethics, aesthetics, political philosophy and related areas. Source material will be selected from recent books and articles.
Prerequisite: 2 courses in PHIL.
Repeatable to: 12 credits if content differs.

PHIL440 Contemporary Ethical Theory (3 Credits)
Contemporary work on fundamental problems in ethical theory, such as whether there are moral truths, whether and how our moral claims can be justified, what exactly makes an act right or wrong, the nature of moral language, and the role of reason and emotion in moral judgment.
Prerequisite: PHIL341; or permission of instructor.

PHIL443 Moral Psychology (3 Credits)
Philosophers often stress reasoning as the appropriate source for practical and moral action. Would a realistic view of human psychology undermine this assumption? This course will examine recent philosophical and empirical work on the relevance of emotion and/or intuition to rationality, moral worth, and moral judgment.
Prerequisite: 2 courses in PHIL.
Recommended: PHIL341 is strongly recommended for background on the historical authors that the readings make reference to.
Credit Only Granted for: PHIL408P or PHIL443.
Formerly: PHIL408P.

PHIL445 Contemporary Political Philosophy (3 Credits)
Major trends in contemporary political philosophy: liberal, libertarian, communitarian, socialist, feminist.
Restriction: Must have completed 3 credits in philosophy or political theory; or permission of ARHU-Philosophy department. And sophomore standing or higher.

PHIL446 Law, Morality, and War (3 Credits)
An exploration of fundamental moral and legal issues concerning war.

PHIL453 Philosophy of Science II (3 Credits)
A comprehensive survey of developments in the main problems of the philosophy of science from logical positivism to the present. The nature of theories, models, laws, and counterfactuals, testing, inductive logic, and confirmation theory, experimental methodology, measurement, explanation, concept formation, growth of scientific knowledge, and scientific realism.
Prerequisite: Students must have completed a minium of two philosophy courses.

PHIL458 Topics in the Philosophy of Science (3 Credits)
A detailed examination of a particular topic or problem in philosophy of science.
Repeatable to: 6 credits if content differs.

PHIL469 Study Abroad Special Topics IV (1-6 Credits)
Special topics course taken as part of an approved study abroad program.
Repeatable to: 15 credits if content differs.

PHIL470 Logical Theory II: Incompleteness and Undecidability (3 Credits)
Introduces the formal theory of computation, and then presents the the central limitative results of modern first-order logic: Church's undecidability theorem and Godel's first and second incompleteness theorems. The primary focus of the course is a thorough technical study of these fundamental results, but we will also discuss some of the philosophical issues they raise. Further topics may include second-order logic.
Prerequisite: PHIL370; or permission of instructor.

PHIL478 Topics in Philosophical Logic (3 Credits)
Philosophical logics result from the application of formal techniques to problems of philosophical interest; these logics often have applications in other areas as well, such as AI, linguistics, psychology, economics, and law. This course will either concentrate on a particular family of philosophical logics (such as modal or temporal or defeasible logics) or else survey a number different logical systems.
Prerequisite: PHIL271; or permission of instructor.
Recommended: PHIL470.
Repeatable to: 9 credits if content differs.

PHIL488 Topics in Philosophy of Cognitive Studies (3 Credits)
Examination of a particular topic or problem in philosophy of cognitive studies.
Prerequisite: 3 credits in PHIL courses; or permission of ARHU-Philosophy department.
Repeatable to: 9 credits if content differs.

PHIL489 Undergraduate Seminar in Philosophy (3-6 Credits)
An intensive examination of a philosophical topic or topics.
Restriction: Permission of ARHU-Philosophy department.
Repeatable to: 6 credits if content differs.

PHIL490 The Practice of Philosophy: How To Develop Your Own Work (3 Credits)
Writing philosophical papers, presenting them to an audience, and responding critically and constructively to the papers and talks of others are skills central to the practice of philosophy. This course will help students to enhance those skills in a seminar-style format. Students should come to the course with a paper of their own (likely from another course) that they would like to develop.
Prerequisite: Three upper-level (300- or 400-level) courses in philosophy or permission of the instructor.
Credit Only Granted for: PHIL408R or PHIL490.
Formerly: PHIL408R.

PHIL498 Topical Investigations (1-3 Credits)

PHIL640 Value Theory (3 Credits)
A basic course in value theory for beginning graduate students, covering a number of topics in depth, to provide a springboard for further study and research in the area.

PHIL660 Metaphysics, Mind, and Language (3 Credits)
A basic course on selected issues in metaphysics, philosophy of mind, and philosophy of language for beginning graduate students, covering a number of topics in depth, to provide a springboard for further study and research in the area.

PHIL688 Selected Problems in Philosophy (1-3 Credits)
Restriction: Permission of instructor.

PHIL788 Research in Philosophy (1-6 Credits)
Prerequisite: Permission of advisor or chair of tutorial-advisory committee required.
Repeatable to: 6 credits.

PHIL798 Master's Level Independent Study (1-3 Credits)
Master's level independent study.
Restriction: Permission of instructor.
Repeatable to: 6 credits if content differs.

PHIL799 Master's Thesis Research (1-6 Credits)

PHIL808 Seminar in the Problems of Philosophy (3 Credits)
Restriction: Permission of instructor.

PHIL828 Seminar in the History of Philosophy (3 Credits)
Restriction: Permission of instructor.

PHIL838 Seminar in Aesthetics (3 Credits)
Restriction: Permission of instructor.

PHIL848 Seminar in Ethics (3 Credits)
Restriction: Permission of instructor.

PHIL858 Seminar in Logic and Philosophy of Sciences (3 Credits)
Restriction: Permission of instructor.

PHIL859 Proseminar in the Philosophy of Science (3 Credits)
Seminar on the core areas of research in philosophy of science, with the focus on a theme currently generating attention in the field.
Restriction: Permission of instructor.
Repeatable to: 9 credits if content differs.

PHIL868 Seminar in Metaphysics (3 Credits)
Restriction: Permission of instructor.

PHIL869 Seminar in the Theory of Knowledge (3 Credits)
Restriction: Permission of instructor.

PHIL878 Seminar in Cognitive Studies (3-9 Credits)
Methodology and research in various disciplines involved in cognitive studies.
Restriction: Permission of ARHU-Philosophy department.
Repeatable to: 9 credits if content differs.

PHIL879 Seminar in Philosophy and Cognitive Studies (3 Credits)
Repeatable to: 9 credits if content differs.

PHIL888 Professional Mentoring for Doctoral Students (1-3 Credits)
Work with a faculty advisor on various aspects of professional development.
Restriction: Permission of ARHU-Philosophy department.
Repeatable to: 3 credits if content differs.

PHIL889 Pedagogical Mentoring for Doctoral Students (1-3 Credits)
Work with a faculty advisor to develop and improve pedagogical skills.
Restriction: Permission of ARHU-Philosophy department.
Repeatable to: 3 credits if content differs.

PHIL898 Pre-Candidacy Research (1-8 Credits)

PHIL899 Doctoral Dissertation Research (1-8 Credits)

PHSC - Public Health Science

PHSC401 History of Public Health (3 Credits)
Emphasis is on the history of public health in the Western world from antiquity to the present. Also examines the influence of public health developments as they relate to the Western world as well as throughout diverse cultures and societies across the globe. Analysis focuses on the interaction among Western and non-Western cultures with respect to health issues, including science, policies, prevention and treatment.
Restriction: Must be in Public Health Science program; and must have earned a minimum of 45 credits.
Credit Only Granted for: PHSC401 or SPHL401.
Formerly: SPHL401.

PHSC405 Policy Advocacy and Public Health (3 Credits)
Students will identify and analyze policy solutions to public health problems and determine advocacy strategies to encourage policy makers to implement the recommendations. Lectures, class discussions, group work and mock advocacy exercises will integrate the principles and practice of public health advocacy. Guest lecturers from a variety of settings will give students a broad range of perspectives and advocacy experiences.
Prerequisite: Minimum grade of C- in HLSA300.
Restriction: Must be in Public Health Science program; and must have earned a minimum of 60 credits.

PHSC410 Public Health Program Planning and Evaluation (3 Credits)
Students will become familiar with the dynamics of public health program planning, and the basic process of identifying unmet needs. They will be able to identify different types of program evaluation, including needs assessment, formative research, process evaluation, impact assessment, and cost analysis.
Restriction: Must be in Public Health Science program; and junior standing or higher.
Credit Only Granted for: PHSC410 or SPHL410.
Formerly: SPHL410.

PHSC412 Food, Policy, and Public Health (3 Credits)
Broad overview of the impact of food and food policy on public health. Course covers topics such as access to food, food systems, influence of food policies on the individual, the cost of food, influences on food selection, food safety risks and responses, nutrition-related health challenges, and a comparison of US food/nutrition issues with those of other nations.
Prerequisite: Must have completed HLSA300 with a C- or higher.
Recommended: NFSC100.
Restriction: Must be in Public Health Science program; and junior standing or higher.
Credit Only Granted for: PHSC412 or SPHL412.
Formerly: SPHL412.

PHSC415 Essentials of Public Health Biology: The Cell, The Individual, and Disease (3 Credits)
Presents the basic scientific and biomedical concepts of modern public health problems and explores in depth mechanisms and models of the major categories of disease. The biologic principles presented are foundations to public health disease prevention, control, or management programs.
Prerequisite: Minimum grade of C- in BSCI202.
Recommended: BSCI223.
Restriction: Must be in Public Health Science program; and junior standing or higher.
Credit Only Granted for: PHSC415, SPHL415 or SPHL498J.
Formerly: SPHL415 and SPHL498J.

PHSC420 Vaccines and Immunology (3 Credits)
An exploration of immunology and vaccines through a public health lens. We will examine the cells, systems, and molecules that comprise the human immune system and defend your body against disease. In addition, we will discuss the strategies used during vaccine development including the history and future of vaccination and how increased understanding of the immune system has allowed scientists to improve and refine the process. Finally we will examine the current social and political situation surrounding vaccination and the roles and responsibility of public health practitioners.
Prerequisite: Minimum grade of C- in BSCI202.
Recommended: CHEM231.
Restriction: Must have earned a minimum of 60 credits. And must be in Public Health Science program; or permission of instructor.

PHSC425 Genetics, Genomics, and Public Health (3 Credits)
Recent advances in genomic science and biomedical technologies have increased our understanding of the genetic basis of disease and the interplay between genetics and environmental and behavioral factors. This course will provide a solid background in basic genetics and genomic science and highlight the role of public health professionals in translating breakthroughs in this rapidly transforming field into the clinical setting, program planning, and policy. Topics covered will include the molecular basis for genetic variation, fetal and newborn screening, genetic risk factors for cancer, pharmacogenetics, the role of pathogen genomics in outbreak investigation, and applications of genetic engineering in solving public health issues.
Prerequisite: Must have completed BSCI170 and 171 with a C- or higher.
Recommended: BSCI222 and BSCI223.
Restriction: Must have earned a minimum of 60 credits; and must be in Public Health Science program.
Credit Only Granted for: SPHL498X OR PHSC425.
Formerly: SPHL498X.

PHSC426 Climate Change and Health (3 Credits)
Climate changes pose significant risks to population health by affecting air quality, the availability of safe drinking water, infectious disease transmission, food security, and access to housing, land, and livelihoods. Students examine the relationship between climate change and human health, focusing on how climate change vulnerability varies between populations by geographic, demographic, and socioeconomic characteristics.
Prerequisite: Minimum grade of C- in MIEH300.
Restriction: Must be in Public Health Science program.

PHSC430 Public Health in the City: Perspectives on Health in the Urban Environment (3 Credits)
Exposure to issues related to city habitation and the health of the public, including how the urban environment impacts the lives and health of city dwellers, including discussion of the social determinants of health. Students are encouraged to think about urban health and policy, and to question the current state of urban public health. Issues of race, class, and equality will be discussed throughout the course as they relate to each of these topics.
Prerequisite: Minimum grade of C- in BSCI202 and MIEH300.
Restriction: Must be in Public Health Science program; and junior standing or higher.
Credit Only Granted for: PHSC430 or SPHL498G.
Formerly: SPHL498G.

PHSC440 Public Health Nutrition (3 Credits)
Engages students in conceptual thinking about the relationship between public health and nutritional health. Students will analyze and interpret "A Framework for Public Health Nutrition." Students will identify determinants of nutritional health, assess nutritional health in individuals and populations, develop strategies to mitigate these issues, and analyze and evaluate public health nutrition policies.
Prerequisite: A minimum of C- in BSCI170, BSCI171, CHEM131, CHEM132 and EPIB301.
Restriction: Must be in Public Health Science program.
Credit Only Granted for: PHSC440 or NFSC498L.

PHSC450 Addressing Social and Structural Inequities Through Public Health (3 Credits)
A focus on addressing social and structural inequities within race, gender, disability, and class through various perspectives in the field of public health. Students explore the causes, challenges, consequences, and extent these injustices have on health disparities from local, national, and global perspectives. Students view these inequities through the lens of the affected populations, and work interactively and collaboratively to interpret, design, and evaluate public health interventions and approaches to address key health disparities within specific communities. The aim of this course is to help students define appropriate research and address structural inequities with innovative approaches through the professional practice of public health.
Prerequisite: Minimum grade of C- in MIEH300; and 1 course with a minimum grade of C- from either SPHL100 or PHSC300.

PHSC490 Public Health in Action: Applied Health Solutions (3 Credits)
Engage in hands-on public health problem-solving by partnering with organizations tackling real-world health challenges. Students will collaborate to design culturally responsive, evidence-based interventions. Gain valuable skills in health consulting, communication, and teamwork while making a measurable impact on public health.
Prerequisite: Minimum grade of C- or in SPHL100 and HLTH366.
Restriction: Must be a Public Health Science major; and must have a minimum of 60 credits.
Credit Only Granted for: PHSC388G or PHSC490.
Formerly: PHSC388G.

PHSC497 Public Health Science Capstone (3 Credits)
The capstone course is the culminating experience for Public Health Science students and must be taken only in the final semester of study. The Public Health Science capstone course is designed to challenge students to integrate the five core areas of public health in investigating, researching and addressing public health issues. Throughout the semester, students will be required to evaluate, analyze and synthesize scholarly works as they research and propose solutions to a variety of public health issues. By the conclusion of this research based course, students will understand how the various public health perspectives can combine in addressing and informing public health practices.
Prerequisite: Must have completed the professional writing requirement with a C- or higher; and minimum grade of C- in PHSC450.
Restriction: Must have earned a minimum of 100 credits; and must be in Public Health Science program; and must be in the final semester of undergraduate study.
Credit Only Granted for: SPHL498F or PHSC497.
Formerly: SPHL498F.

PHYS - Physics

PHYS401 Quantum Physics I (4 Credits)
The first of a two-semester survey of quantum mechanics, employing the formalism of Dirac notation, linear operators, and Hilbert spaces. Quantum state preparation and measurement, the Schroedinger equation in both its matrix and wave descriptions, and applications to systems such as the harmonic oscillator and the hydrogen atom.
Prerequisite: PHYS265 and PHYS371; and 1 course from (PHYS313, PHYS373, or MATH462).
Additional Information: Intended primarily for Physics and Astronomy majors.

PHYS402 Quantum Physics II (3 Credits)
Applications of quantum mechanics to atomic, molecular, and solid state systems. Addition of angular momenta, multiparticle states, perturbation theory and other approximation techniques, scattering, and symmetries.
Prerequisite: PHYS401.

PHYS404 Introduction to Statistical Thermodynamics (3 Credits)
Introduction to basic concepts in thermodynamics and statistical mechanics.
Prerequisite: PHYS371 or PHYS420.

PHYS405 Advanced Experiments (3 Credits)
Advanced laboratory techniques. Selected experiments from many fields of modern physics. Emphasis on self-study of the phenomena, data analysis, and presentation in report form.
Prerequisite: PHYS375.
Restriction: Must be in a major within CMNS-Physics department.

PHYS406 Experimental Research Development (3 Credits)
Part I of a two-semester, independent, experimental research project supervised by a faculty mentor. The student participates significantly in experimental design, set-up, and collection and analysis of real, physical data, including the evaluation of experimental uncertainties. The student maintains a lab notebook and completes an end-of-semester progress report.
Prerequisite: PHYS375.
Restriction: Permsission of CMNS-Physics department.
Additional Information: The student is expected to work on the project for approximately 9 hours per week in a standard semester or a total of 135 hours in a non-standard semester. PHYS406 may not be used to satisfy an advanced physics elective.

PHYS407 Undergraduate Experimental Research (3 Credits)
Students develop and complete an independent, experimental research project with a professor in the Physics Department. The project should be a continuation of work done in PHYS406. To obtain permission, students must submit a proposal describing the experimental work to be completed and this proposal must be approved by their faculty mentor, the associate chair for undergraduate education and the chair of the laboratory committee. Students must maintain a lab notebook, give an oral presentation and complete a written report on their research that includes data and error analysis.
Prerequisite: PHYS406; and permission of CMNS-Physics department.
Restriction: Must be in a major within CMNS-Physics department; and senior standing.

PHYS410 Classical Mechanics (3 Credits)
Classical mechanics at a more advanced level, including its Newtonian, Lagrangian, and Hamiltonian formulations. Conservative and non-conservative forces; the calculus of variations; central force motion; non-inertial frames of reference; rigid body rotations; and selected advanced topics.
Prerequisite: PHYS265 and PHYS273; and (MATH243 or MATH246).

PHYS411 Intermediate Electricity and Magnetism (4 Credits)
Foundations of electromagnetic theory, with extensive applications of the methods. Thorough treatment of wave properties of solutions of Maxwell's equations.
Prerequisite: PHYS313 or PHYS373.

PHYS412 Intermediate Electricity and Magnetism I (4 Credits)
The first semester of a two semester course with emphasis on electrostatics and magnetostatics, boundary value problems, fields in matter, electrodynamics, and Maxwell's equations.
Prerequisite: PHYS373.

PHYS413 Electricity and Magnetism II (3 Credits)
The second semester of a two semester course with emphasis on electromagnetic waves, potentials and gauge invariance, and relativistic electrodynamics
Prerequisite: PHYS313 or PHYS412.
Credit Only Granted for: PHYS411 or PHYS413.

PHYS420 Principles of Modern Physics (3 Credits)
A survey of atomic and nuclear phenomena and the main trends in modern physics. Appropriate for students in engineering and other physical sciences.
Prerequisite: MATH246. And PHYS271 and PHYS270; or PHYS273.
Credit Only Granted for: PHYS371 or PHYS420.

PHYS428 Physics Capstone Research (2-4 Credits)
Individual, focused research under the guidance of a faculty member. Discussion, presentations and, if appropriate, research group projects involved. Student must submit final research paper for completion of course. Paper may also serve as thesis required for High Honors in Physics. Not intended as a general "reading course" (see PHYS499).
Restriction: Must be in a major within CMNS-Physics department; and senior standing or higher; and permission of instructor.
Repeatable to: 4 credits.

PHYS429 Atomic and Nuclear Physics Laboratory (3 Credits)
Classical experiments in atomic physics and more sophisticated experiments in current techniques in nuclear physics.
Prerequisite: PHYS405.

PHYS431 Introduction to Solid State Physics (3 Credits)
Classes of materials; introduction to basic ideal and real materials' behavior including mechanical, electrical, thermal, magnetic and optical responses of materials; importance of microstructure in behavior. One application of each property will be discussed in detail.
Prerequisite: PHYS271, PHYS270, and MATH241.
Cross-listed with: ENMA460.
Restriction: Junior standing or higher; and must be in the Engineering: Materials Science program or Physics program.
Credit Only Granted for: ENMA460 or PHYS431.
Additional Information: Materials Engineering students take ENMA460 and Physics students take PHYS431.

PHYS441 Topics in Nuclear and Particle Physics (3 Credits)
A survey of concepts in particle and nuclear physics, with a topical emphasis on the impact of the Weak Interaction and the discovery of Parity Violation.
Prerequisite: PHYS401 or PHYS402.
Corequisite: PHYS402.

PHYS444 Computing Beyond the Standard Model of Particle Physics (3 Credits)
An exploration of the computing languages and techniques used to analyze large data sets in Large Hadron Collider physics with some discussion of applications in unrelated fields.
Prerequisite: PHYS371 and PHYS373; or permission of instructor.

PHYS456 Making Physics Experiments (3 Credits)
Laboratory course emphasizing practical skills used for making Physics experiments within the broader context of the maker movement and the maker culture. Design, fabrication, hands-on skills, repair, and safety. Practical skills not otherwise covered in traditional coursework (e.g.: carpentry, electronics disassembly/assembly, soldering, etc.).
Prerequisite: PHYS276; or permission of instructor.
Restriction: Permission of Physics Department.
Credit Only Granted for: PHYS499X or PHYS456.
Formerly: PHYS499X.

PHYS457 Introduction to Quantum Computing (3 Credits)
An introduction to the concept of a quantum computer, including algorithms that outperform classical computation and methods for performing quantum computation reliably in the presence of noise. As this is a multidisciplinary subject, the course will cover basic concepts in theoretical computer science and physics in addition to introducing core quantum computing topics. No previous background in quantum mechanics is required.
Prerequisite: 1 course with a minimum grade of C- from (ENEE290, MATH240, MATH341, MATH461, MATH243); and 1 course with a minimum grade of C- from (CMSC351, PHYS313).
Cross-listed with: CMSC457.
Credit Only Granted for: CMSC457 or PHYS457.
Additional Information: Only Physics students may use MATH243 to satisfy the Linear Algebra prerequisite for CMSC/PHYS457.

PHYS467 Introduction to Quantum Technology (3 Credits)
Investigates the basic concepts/building blocks of quantum computers, quantum key distribution, quantum networks, and quantum sensors. Examines what is needed to form a working qubit and different hardware platforms that implement them (for example, trapped ions, superconducting microwave circuits, color centers, and neutral atoms.) Conceptual and computational familiarity with complex numbers, vector spaces, bases, matrices, eigenvectors, and eigenvalues will be assumed, as well as quantum states/wave functions, and quantum measurement. Familiarity with spin-1/2 systems, and Pauli matrices is highly recommended.
Prerequisite: MATH141 and MATH240 or equivalent; and one of the following: PHYS360, PHYS401, PHYS457, CMSC457, or ENEE491; or permission of instructor.
Cross-listed with: ENEE492.
Credit Only Granted for: PHYS467 or ENEE492.

PHYS474 Computational Physics (3 Credits)
Introduction to computational physics. Overview of some of the most widely used methods of computational physics and computational methods, including data analysis and statistical methods, visualization, numerical solutions of ordinary and partial differential equations (classical equations of motion, Poisson's equation, time independent and time dependent Schrodinger equations) and Monte Carlo simulations. In addition to giving the students a basic working knowledge of these particular techniques, the goal is to make them proficient in scientific computing and programming in general, so that they will be prepared to tackle other computational and data analysis problems that they may encounter in the future. This course will use the programming language Python.
Prerequisite: PHYS373; and (PHYS165, CMSC106, or CMSC131).
Recommended: PHYS401 (strongly recommended).
Additional Information: Students will need a laptop for this course to run specific software; however, arrangements will be made for those who need them. Students will need to load the Python 3 language on your computer, which will be done in the first week of class. The class will use the "Anaconda" environment/distribution, which is available for Mac/Windows/Linux. Contact the department for more information.

PHYS476 Introduction to Applied Machine Learning (3 Credits)
Introduces machine learning techniques that are becoming pertinent in the technology industry. Focus on hands-on work using popular high-level libraries. Students are expected to have a background in functional programming, linear algebra, calculus, and mathematical modeling.
Prerequisite: PHYS165, PHYS274, and PHYS276; or interested students with backgrounds in functional programming, linear algebra and statistics, should contact the instructors to request permission.

PHYS485 Electronic Circuits (3 Credits)
Theory and application to experimental physics of modern semiconductor analog and digital circuits. Emphasis on understanding passive and active elements in practical circuits. Topics span the range from simple transistor circuits to microcomputers.
Prerequisite: PHYS272 and PHYS276.
Restriction: Must be in a major within CMNS-Physics department.

PHYS487 Computerized Instrumentation (3 Credits)
Concentration on computer interfaces to measurement devices. Includes a review of basic electronic circuits and measurement devices. Extensive work with arduinos, making use of a variety of measurement probes. Includes introduction to the C++ programming language, the Segger development environment, and real-time operating systems (RTOS) used in advanced physics experiments.
Prerequisite: PHYS276 or Permission of Instructor.
Restriction: Departmental Permission.

PHYS499 Special Problems in Physics (1-16 Credits)
Research or special study. Credit according to work done.

PHYS601 Theoretical Dynamics (3 Credits)
Lagrangian and Hamiltonian mechanics, two-body central force problem, rigid body motion, small oscillations, continuous systems.
Prerequisite: PHYS410; or students who have taken courses with comparable content may contact the department.

PHYS603 Methods of Statistical Physics (3 Credits)
Foundations and applications of thermodynamics and statistical mechanics.
Credit Only Granted for: PHYS602 or PHYS603.

PHYS604 Methods of Mathematical Physics (3 Credits)
Ordinary and partial differential equations of physics, boundary value problems, Fourier series, Green's functions, complex variables and contour integration.
Prerequisite: Must have completed coursework in advanced calculus; and (PHYS411 and PHYS410). Or students who have taken courses with comparable content may contact the department.

PHYS606 Electrodynamics (4 Credits)
Classical electromagnetic theory, electro- and magnetostatics, Maxwell equations, waves and radiation, special relativity.
Prerequisite: PHYS604; or students who have taken courses with comparable content may contact the department.

PHYS610 Mathematical Methods and Their Applications in Classical Mechanics and Electrodynamics I (4 Credits)
First course of a two-semester graduate level sequence on classical mechanics, electrodynamics and relativity and the mathematics that underlie these subjects. Mathematical methods will generally be introduced in the context of relevant physical problems.
Prerequisite: Must have an outstanding undergraduate background in physics.
Restriction: Permission of CMNS-Physics Department.

PHYS611 Mathematical Methods and Their Applications in Classical Mechanics and Electrodynamics II (4 Credits)
Second course of a two-semester graduate level sequence on classical mechanics, electrodynamics and relativity and the mathematics that underlie these subjects. Mathematical methods will generally be introduced in the context of relevant physical problems.
Prerequisite: PHYS610 or permission of instructor.
Restriction: Permission by Department.

PHYS612 Quantum and Statistical Physics I (4 Credits)
First course of a two-semester graduate level sequence on topics in quantum mechanics and statistical mechanics.
Prerequisite: Must have an outstanding undergraduate background in physics.
Restriction: Permission of CMNS-Physics Department.

PHYS613 Quantum and Statistical Physics II (4 Credits)
Second course of a two-semester graduate level sequence on topics in quantum mechanics and statistical mechanics.
Prerequisite: PHYS612; or permission of instructor.
Restriction: Permission of the Physics Department.

PHYS622 Introduction to Quantum Mechanics I (4 Credits)
First and second semesters. A study of the Schroedinger equation, matrix formulations of quantum mechanics, approximation methods, scattering theory, etc. Applications to solid state, atomic, and nuclear physics.
Prerequisite: Must have an outstanding undergraduate background in physics.

PHYS623 Introduction to Quantum Mechanics II (3 Credits)
First and second semesters. A study of the Schroedinger equation, matrix formulations of quantum mechanics, approximation methods, scattering theory etc., and applications to solid state, atomic, and nuclear physics. Continuation of PHYS 622.
Prerequisite: Must have an outstanding undergraduate background in physics.

PHYS624 Introduction to Quantum Field Theory (3 Credits)
Merging relativity and quantum mechanics using quantum fields, scalar field theory and canonical quantization, continuous and discrete symmetries, perturbation theory and scattering amplitudes, renormalized perturbation theory, Lorentz-group representations and fermionic field theories, massive and massless vector field theories and gauge invariance, quantum electrodynamics.
Prerequisite: PHYS613 or PHYS623.

PHYS625 Quantum Many-Body Theory I (3 Credits)
Non-relativistic second quantization, path integrals and functional field integrals, perturbation theory with Feynman diagrams, interacting electron gas.
Prerequisite: PHYS612 and PHYS613.

PHYS626 Quantum Many-Body Theory II (3 Credits)
Continuation of PHYS625. Functional-integral formulation of quantum field theory. Phase transitions and broken symmetry. Magnetism, superconductivity, and other applications. The renormalization group.
Prerequisite: PHYS612, PHYS613, and PHYS625.

PHYS662 Intersections of Technology and Policy: Modernizing the Energy System (3 Credits)
A broad, practical introduction to the issues and assessment approaches used to evaluate technical innovation in the Energy System. Introduction to the use of Sankey Diagrams, Life Cycle Analysis, Techno-economic analysis, and Equilibrium Economic Analysis, as well as policy factors such as Energy Efficiency Standards, Vehicle Fuel Economy, Feed-in-tariffs and environmental regulations.
Restriction: Must be a graduate student in the Natural Sciences, Engineering, Public Policy, or Economics; or must be a senior in the above disciplines with a minimum cumulative GPA of 3.0.
Credit Only Granted for: PHYS662 or PLCY699B.

PHYS675 Introduction to Relativity, Gravitation and Cosmology (3 Credits)
Review of special relativity, followed by a study of the equivalence principle, curved spacetimes, and Einstein's equations. Selected applications to the solar system, stellar structure, black holes, gravitational waves, and cosmology.
Prerequisite: PHYS606 and PHYS601.

PHYS685 Research Electronics (3 Credits)
An integrated lecture and laboratory course in electronics with equal emphasis on experimental methods and results and analysis using device models and up-to-date mathematical and numerical tools. Experiments and analysis of circuits with passive and single active devices form the background for the study of operational amplifiers, digital integrated circuits and systems, and microcomputers. The general topics of impedance matching, frequency response, feedback, interfacing and the extraction of signal from noise are stressed.
Prerequisite: An outstanding undergraduate background in physics or permission of the instructor.
Restriction: Must not have completed PHYS485.
Credit Only Granted for: PHYS485 or PHYS685.

PHYS703 Introduction to Nonequilibrium Statistical Physics (3 Credits)
Analysis and microscopic modeling of systems away from thermal equilibrium. Linear response theory, ergodicity, Brownian motion, Monte Carlo modeling, thermal ratchets, far-from-equilibrium fluctuation relations. Introduction to the theoretical tools of nonequilibrium phenomena and their application to problems in physics, chemistry and biology.
Prerequisite: PHYS603 or CHEM687; or permission of instructor.
Cross-listed with: CHEM703, BIPH703, CHPH703.
Credit Only Granted for: BIPH703, CHEM703, CHPH703, or PHYS703.

PHYS708 Seminar in Teaching College Physics (1 Credit)

PHYS709 Seminar in General Physics (1 Credit)

PHYS715 Chaotic Dynamics (3 Credits)
Theory and applications of chaos in dynamical systems including such topics as strange attractors, Lyapanov exponents, quasiperiodicity, period doubling, intermittency, crises, fractal basin boundaries, chaotic scattering, KAM tori, and quantum chaos.
Prerequisite: PHYS601.

PHYS718 Seminar in General Physics (1 Credit)

PHYS719 Seminar in General Physics (1 Credit)

PHYS720 Quantum Technology (3 Credits)
Physical principles behind emerging quantum technologies, from quantum-limited sensors to quantum simulators, by applying quantum optics formalism. Examination of current and emerging platforms for quantum technologies, including neutral atom, ion trap, superconducting circuit, photonic, and spin-based approaches. Focus on hurdles for implementing quantum devices for new applications.
Prerequisite: A good grounding in electromagnetism and quantum mechanics is necessary; familiarity with density matrices and master equations will be helpful.

PHYS721 Atomic and Optical Physics I (Survey) (3 Credits)
A survey of topics involving the physics of atoms and their interaction with radiation, including atoms in external fields, lasers, atomic spectroscopy and atomic structure.
Prerequisite: PHYS623.

PHYS728 Seminar in Atomic and Molecular Physics (1 Credit)

PHYS731 Solid State Physics: Survey (3 Credits)
A variety of topics such as crystal structure, mechanical, thermal, electrical, and magnetic properties of solids, band structure, the Fermi surface, and superconductivity will be treated. Although the emphasis will be on the phenomena, the methods of quantum mechanics are freely employed in this description.

PHYS732 Introduction to Solid State Physics II (3 Credits)
Second semester of survey course in condensed matter physics including topics in semiconductors, surface physics, magnetism and superconductivity.
Prerequisite: PHYS731.

PHYS738 Seminar in Experimental Solid State Physics (1 Credit)

PHYS739 Seminar in Theoretical Solid State Physics (1 Credit)

PHYS748 Seminar in Experimental Nuclear Physics (1 Credit)

PHYS749 Seminar in Theoretical Nuclear Physics (1 Credit)

PHYS752 Elementary Particle Physics II: Theory (3 Credits)
Survey of elementary particles and their properties, quantum field theory, meson theory, weak interactions, possible extensions of elementary particle theory.
Prerequisite: PHYS751 and PHYS624.

PHYS758 Seminar in Elementary Particles and Quantum Field Theory (1 Credit)

PHYS759 Seminar in Elementary Particles and Quantum Field Theory (1 Credit)

PHYS761 Plasma Physics I: Survey (3 Credits)
A detailed study of plasma physics. The first semester treats particle orbit theory, magnetohydrodynamics, plasma waves, and transport phenomena.
Prerequisite: PHYS606 and PHYS604.

PHYS762 Plasma Physics II (3 Credits)
Continuation of PHYS 761. Vlasov theory, including waves, stability, and weak turbulence, kinetic equation theories of correlations and radiative processes.
Prerequisite: PHYS761.

PHYS769 Seminar in Plasma Physics (1 Credit)

PHYS778 Seminar in Space and Cosmic Ray Physics (1 Credit)

PHYS779 Seminar in General Relativity (1 Credit)

PHYS780 Network Science Literature Survey Seminar (1 Credit)
Identify and develop a research project in Network Science. Practice communicating scientific results and concepts to individuals in their own field and in other fields to which the research is applicable.
Credit Only Granted for: PHYS780 or PHYS798T.
Formerly: PHYS798T.

PHYS781 Network Science Research-in-Progress Seminar (1 Credit)
Practice communicating scientific results and concepts to a general scientific audience, based on the student's research-in-progress.
Credit Only Granted for: PHYS781 or PHYS798U.
Formerly: PHYS798U.

PHYS782 Interdisciplinary Research and Communication Practicum for Data-Driven Science (3 Credits)
Semester-long, individual research project under the direction of a faculty mentor. Students will concurrently use this project to develop and refine their communication skills of scientific concepts. Will address interdisciplinary communication with some discussion of data exploration, analysis, and visualization.
Credit Only Granted for: PHYS782 or PHYS798N.
Formerly: PHYS798N.

PHYS798 Special Problems in Advanced Physics (1-3 Credits)
Projects or special study in advanced physics.

PHYS799 Master's Thesis Research (1-6 Credits)

PHYS808 Special Topics in General Physics (1-4 Credits)
Credit according to work done.

PHYS809 Special Topics in General Physics (1-4 Credits)
Credit according to work done.

PHYS818 Special Topics in General Physics (1-4 Credits)
Credit according to work done.

PHYS819 Special Topics in General Physics (1-4 Credits)
Credit according to work done.

PHYS828 Special Topics in Atomic and Molecular Physics (1-4 Credits)
Credit according to work done.

PHYS829 Special Topics in Quantum Mechanics and Quantum Electronics (1-4 Credits)
Credit according to work done.

PHYS830 Topics in Theoretical Condensed Matter Physics (3 Credits)
A variety of current advanced topics in condensed matter theory will be treated in a tutorial format. Students should be familiar with concepts such as renormilization group theory, phase transitions, quantum information, and topological concepts.
Restriction: Permission of instructor.

PHYS838 Special Topics in Experimental Solid State Physics (1-4 Credits)
Credit according to work done.

PHYS839 Special Topics in Theoretical Solid State Physics (1-4 Credits)
Credit according to work done.

PHYS849 Special Topics in Theoretical Nuclear Physics (1-4 Credits)
Credit according to work done.

PHYS851 Advanced Quantum Field Theory (3 Credits)
Renormalized quantum electrodynamics, non-Abelian gauge theories, quantum chromodynamics and asymptotic freedom, electroweak theory and Higgs mechanism, path-integral formulation and non-perturbative approaches to quantum field theories.
Prerequisite: PHYS624.

PHYS858 Special Topics in Elementary Particles and Quantum Field Theory (1-4 Credits)
First semester.
Prerequisite: PHYS752 and PHYS851.

PHYS859 Special Topics in Elementary Particles and Quantum Field Theory (1-4 Credits)
Credit according to work done.

PHYS869 Special Topics in Plasma Physics (1-4 Credits)
Credit according to work done.

PHYS878 Special Topics in Space and Cosmic Ray Physics (1-4 Credits)
Credit according to work done.

PHYS879 Special Topics in General Relativity (1-4 Credits)
Credit according to work done.

PHYS888 Special Topics in Applied Physics (2 Credits)

PHYS889 Special Topics in Interdisciplinary Problems (1-4 Credits)
Credit according to work done.
Restriction: Permission of instructor.

PHYS898 Pre-Candidacy Research (1-8 Credits)

PHYS899 Doctoral Dissertation Research (1-8 Credits)

PLCY - Public Policy

PLCY400 Senior Capstone (3 Credits)
Public Policy students will take the skills and knowledge gained through their curriculum and apply them through their senior capstone course. Students will work in teams on problems and issues presented by outside clients, with guidance from faculty facilitators and interaction with the clients. Each team will work with the client to address a particular problem and produce a mutually agreed upon outcome. These hands on projects will advance students' understanding of the analytical, leadership, communication and problem solving skills necessary to address today's policy problems while allowing them to gain professional level experience that could contribute to their success in their post UMD endeavors. The course will conclude with an event that allows all teams to present their findings and outcomes to their client while being evaluated by faculty and public policy professionals.
Prerequisite: PLCY306.
Restriction: Permission of PLCY-School of Public Policy; and must have earned a minimum of 90 credits.

PLCY401 Making Policy Work: Contemporary Challenges and Solutions (3 Credits)
How do we make policies work for an increasingly diverse and dynamic populace? Today's challenges require an understanding of key variables and constraints (e.g., structural, cultural, bureaucratic, administrative) affecting both policy implementation and failure. This course allows students to analyze and evaluate current implementation plans, policies, and projects. Students will have the opportunity to create and propose future recommendations. The course is conducted in a specific policy field, denoted in the section below. It is recommended students take a related elective prior to signing up for this course.
Restriction: Must have earned a minimum of 90 credits. Public Policy majors or by permission only.

PLCY459 Advanced Special Topics in Study Abroad (3 Credits)
Advanced special topics in international and global public policy
Repeatable to: 9 credits if content differs.

PLCY488 Advanced Special Topics in Public Policy (3 Credits)
Advanced special topics for upper level students focusing on topics related to Public Policy.
Restriction: Must have earned a minimum of 60 credits.
Repeatable to: 6 credits if content differs.

PLCY610 Quantitative Aspects of Public Policy (3 Credits)
Introduces statistical methods needed for evaluating and choosing among policy options. Topics include probability; decision-making under uncertainty; the organization, interpretation, and visual display of complex data; prediction and inferences about causality; hypothesis testing; and linear and multiple regression. Develops analytical skills and the ability to apply theory to complex, real-world problems.
Restriction: Must be in a major in PLCY-School of Public Policy; or permission of PLCY-School of Public Policy.
Credit Only Granted for: PLCY610 or PUAF610.
Formerly: PUAF610.

PLCY611 Quantitative Analysis of Policy Issues (3 Credits)
Study of a series of problems and the development of quantitative techniques to describe or evaluate the problem. The organization and interpretation of complex data and its use for prediction and inference about casual effects. The definition of objectives, trade-offs among objectives, and allocation of resources to meet objectives. Sensitivity of outcomes to changing conditions.
Restriction: Must be in a major in PLCY-School of Public Policy; or permission of PLCY-School of Public Policy.
Credit Only Granted for: PLCY611 or PUAF611.
Formerly: PUAF611.

PLCY620 Political Analysis (3 Credits)
Examination of politics as a process for allocating scarce resources among claimants for public benefits. Comparision of the allocative model of politics with other distributive processes, such as markets. Comparison of the model with behavior of different political institutions, such as Congress and the presidency. Study of politics as a process with distinctive concepts of rationality. The translation of voter and interest group preferences into public choices. The impact of political decisions on competing constituencies.
Restriction: Must be in a major in PLCY-School of Public Policy; or permission of PLCY-School of Public Policy.
Credit Only Granted for: PLCY620 or PUAF620.
Formerly: PUAF620.

PLCY630 Normative and Political Dimensions of Public Policy (3 Credits)
Explores the normative and political dimensions of governance--or policymaking--at the domestic (focusing on the US) and global levels. Policymaking involves a myriad of public and private actors at the local, national, transnational, and global levels that have competing aims and values. Their interaction produces formal and informal policies that affect the international order, interstate relations, subnational dynamics, and individuals. Drawing on theory from multiple disciplines and case examples, the course examines governance at these interrelated levels. Students learn core concepts, debates, and actors involved in policy making, develop tools to identify the causes and consequences of different policies, and build skills to influence public governance. Students also critically analyze how the actors, institutions, and scholarship covered perpetuate systemic racism and other inequities based on gender, class, ethnicity, sexual orientation, religion, dis/ability, etc.
Restriction: Must be in a major in PLCY-School of Public Policy; or permission of PLCY-School of Public Policy.
Credit Only Granted for: PLCY630 or PLCY688E.
Formerly: PLCY688E.

PLCY631 Governance: Leadership, Management and Accountability (3 Credits)
Emphasizes that regardless of technical specialization, public policy practitioners are required to lead people and organizations, manage resources and processes, and be held accountable for their actions. Provides knowledge, insights, skills, and abilities to successfully participate in and contribute to the policy process and lead and manage in line with democratic norms and values. Shows the need to pursue efficiency, effectiveness, and speed while also prioritizing justice, equity, procedural fairness, and due process. Focuses on the "people" side of organizational life, ethical decision-making, and the ability to communicate effectively.
Restriction: Must be in a major in PLCY-School of Public Policy; or permission of PLCY-School of Public Policy.
Credit Only Granted for: PLCY631 or PLCY688G.
Formerly: PLCY688G.

PLCY640 Microeconomic and Policy Analysis (3 Credits)
Applies intermediate microeconomic theory to public policy issues: resource allocation by firms and consumers; the response of economic agents to changes in incentives; market allocations in competitive and non-competitive environments; and market failures and government remedies. Uses extended case studies of particular issues in such areas as the environment (acid rain), international trade (tariffs), industry regulation (cable TV), and the provision of public goods (highways).
Restriction: Must be in a major in PLCY-School of Public Policy; or permission of PLCY-School of Public Policy.
Credit Only Granted for: PLCY640 or PUAF640.
Formerly: PUAF640.

PLCY641 Macroeconomics and Policy Analysis (3 Credits)
Studies the behavior of the economy as a whole: the level of national income, unemployment, and inflation; the vulnerability of the U.S. economy to external influences; possible federal influence over the level of economic activity; and the consequences for prices, employment and the U.S. trade deficit. Also examines possible U.S. policy responses to widespread debt crises in developing countries.
Restriction: Must be in a major in PLCY-School of Public Policy; or permission of PLCY-School of Public Policy.
Credit Only Granted for: PLCY641 or PUAF641.
Formerly: PUAF641.

PLCY650 Moral Dimensions of Public Policy (3 Credits)
Explores the moral issues involved in public policy questions; the limits and usefulness of decision-making tools; problems of choosing, justifying and using criteria to judge a program's success and suitability; ethichal issues involving the welfare state and income distribution; and possible obligations beyond one's political community and generation.
Restriction: Must be in a major in PLCY-School of Public Policy; or permission of PLCY-School of Public Policy.
Credit Only Granted for: PLCY650 or PUAF650.
Formerly: PUAF650.

PLCY659 Special Topics in Study Abroad (3 Credits)
Students will learn about public policy under different governance models and cultural contexts through an immersive experience where they will compare policy ideas and institutions. They will gain a deeper understanding of policy formulation, implementation, and effects in diverse societies, giving them a global perspective on policy issues which will enhance their critical analysis skills and career readiness.
Repeatable to: 6 credits.

PLCY660 Environmental Policy Workshop (3 Credits)
Students work as a team to analyze and recommend responses to a current enviornmental policy issue. Emphasizes problem definition, organization of information and presentation of results.
Restriction: Must be in a major in PLCY-School of Public Policy; or permission of PLCY-School of Public Policy.
Credit Only Granted for: PLCY660 or PUAF660.
Formerly: PUAF660.

PLCY670 Public Budgeting & Financial Management (3 Credits)
Covers how governments raise, spend, borrow, and manage public funds. Reviews federal,state, and local budget processes and introduces analytical techniques including basic spreadsheet skills, evaluating alternative revenue sources, revenue and expenditure forecasting, cost allocation, capital budgeting, cost-benefit analysis, discounting and present value, bond analysis, cash management and intergovernmental finance.
Restriction: Must be in a major in PLCY-School of Public Policy; or permission of PLCY-School of Public Policy.
Credit Only Granted for: PLYC670 or PUAF670.
Formerly: PUAF670.

PLCY671 Public Sector Finance (3 Credits)
The goal of this course is to provide a useful overview of basic public sector financial management principles in a simulated managerial situation to midcareer students currently working in government and nonprofit organizations.
Restriction: Must be in a major in PLCY-School of Public Policy; or permission of PLCY-School of Public Policy.
Credit Only Granted for: PLCY671 or PUAF671.
Formerly: PUAF671.

PLCY680 Examining Social Identity and Pluralism in Public Policy (3 Credits)
Understanding how groups and individuals develop and coexist in society is an essential part of public policy. Using the classroom as a laboratory, students will explore identity development and how the intersections of race, class, gender, sexual orientation, and other identities shape perceptions that inform decision-making and policy development. From historical scholars to current day movement leaders, this course equips students with tools necessary to critically analyze pluralism, power, and identity; and the skills needed to shape meaningful and equitable public policy and working and civic environments for all.
Restriction: Must be in a major in PLCY-School of Public Policy; or permission of PLCY-School of Public Policy.
Credit Only Granted for: PLCY680 or PLCY699D.
Formerly: PLCY699D.

PLCY688 Topics in Public Policy (1-3 Credits)
Special topics in Public Policy.
Restriction: Must be in a major in PLCY-School of Public Policy; or permission of instructor.
Repeatable to: 18 credits if content differs.
Credit Only Granted for: PLCY688 or PUAF688.
Formerly: PUAF688.

PLCY689 Public Policy Topics (1-3 Credits)
Special Topics in Public Policy.
Restriction: Must be in a major in PLCY-School of Public Policy; or permission of instructor.
Repeatable to: 18 credits if content differs.
Credit Only Granted for: PLCY689 or PUAF689.
Formerly: PUAF689.

PLCY690 Policy Engagement Project (3 Credits)
Students apply skills to a real-world public policy or management issue through a policy engagement (capstone) project. Students engage an outside client to define and complete a professional project under the supervision of School faculty. The project utilizes skills and knowledge gained through SPP coursework, expands students' integrative capacity, and serves as a bridge to professional opportunities. In this first half of a two-semester course sequence, students identify a client and problem, scope and define the problem, and draw up a plan of work. They perform background research on the problem, the context and relevant substantive domains. They also develop the research methodology for their project, which could include qualitative, quantitative, mixed methods, or other approaches. Projects vary in substantive focus and may encompass policy analysis, program evaluation, management or organizational studies, or comprehensive literature reviews.
Restriction: Must be in a major in PLCY-School of Public Policy; or permission of PLCY-School of Public Policy.
Credit Only Granted for: PLCY690 or PLCY699X.
Formerly: PLCY699X.

PLCY692 Leadership Principles and Practices (3 Credits)
This course will introduce leadership principles and practices to students by focussing on the theory of leadership, different leadership themes and skills, and discussions with practitioners.
Restriction: Must be in a major in PLCY-School of Public Policy; or permission of PLCY-School of Public Policy.
Credit Only Granted for: PLCY692 or PUAF692.
Formerly: PUAF692.

PLCY698 Selected Topics in Public Affairs (1-3 Credits)
Special topics that arise in public policy.
Restriction: Must be in a major in PLCY-School of Public Policy; or permission of PLCY-School of Public Policy.

PLCY699 Selected Topics Public Policy (1-3 Credits)
Special topics that arise in public policy.
Restriction: Must be in a major in PLCY-School of Public Policy; and permission of PLCY-School of Public Policy.
Credit Only Granted for: PLCY699 or PUAF699.
Formerly: PUAF699.

PLCY700 Trade Policy, Geopolitics, Development and Climate (3 Credits)
Examines challenges posed for international trade policy by geopolitical rifts, the increased weight of developing nations in the world economy, and climate deterioration. It covers the arguments for and against international trade amid polarized politics; how trade policy is made at the World Trade Organization, in Regional Deals, and in Washington, D.C; how businesses build global supply chains and deal with trade policy uncertainty; the trade policy of China and of developing nations more widely; and the role of trade and of trade policy in the fight against climate change.
Restriction: Must be in a major in PLCY-School of Public Policy; or permission of PLCY-School of Public Policy.

PLCY706 Public Policymaking for Journalists (3 Credits)
Focuses on the political, procedural and administrative realities of policy formation and implementation. Specifically for the Journalism students who staff the Capital News Service.
Restriction: Must be in a major in JOUR-Philip Merrill College of Journalism.
Credit Only Granted for: PLCY706 or PUAF706.
Formerly: PUAF706.

PLCY711 Public Management and Leadership (3 Credits)
Reviews the managerial, political, and ethical problems faced by public sector managers and leaders, including setting an organization's goals, obtaining and protecting a program mandate, designing a service delivery system and implementing a new program.
Restriction: Must be in a major in PLCY-School of Public Policy; or permission of PLCY-School of Public Policy.
Credit Only Granted for: PLCY711 or PUAF711.
Formerly: PUAF711.

PLCY712 Analysis of Fiscal Conditions (3 Credits)
The financial operations of U.S. government at various levels, with emphasis on local governments. Practical problems in revenue management, including revenue forecasting and cash flow analysis; debt management operations, such as borrowing; intergovernmental financial operations, such as grants management and reporting requirements, and personnel management issues that have a direct bearing on governmental finances.
Restriction: Must be in a major in PLCY-School of Public Policy; or permission of PLCY-School of Public Policy.
Credit Only Granted for: PLCY712 or PUAF712.
Formerly: PUAF712.

PLCY715 Government and Non-Profit Accounting (3 Credits)
Basic accounting practices of governmental and non-profit organizations. Emphasis on presentation of data in assessing an organization's financial health, financial data by organizations, structuring of accounting information to achieve management control, way in which evolving national standards influence kinds of information organizations have to apply in the future.
Restriction: Must be in a major in PLCY-School of Public Policy; or permission of PLCY-School of Public Policy.
Credit Only Granted for: PLCY715 or PUAF715.
Formerly: PUAF715.

PLCY716 State and Local Government Budgeting (3 Credits)
State and local government practices as a laboratory for studying public sector financial management.
Restriction: Must be in a major in PLCY-School of Public Policy; or permission of PLCY-School of Public Policy.
Credit Only Granted for: PLCY716 or PUAF716.
Formerly: PUAF716.

PLCY717 Federal Budgeting: Policy and Process (3 Credits)
Budgeting as a political and administrative instrument of government. Development of budgeting, the multiple uses of the budget, including role in fiscal policy and resource allocation, the roles and relationships of major participants, and effects of resource scarcity on budgeting behavior. Emphasis on the federal level.
Restriction: Must be in a major in PLCY-School of Public Policy; or permission of PLCY-School of Public Policy.
Credit Only Granted for: PLCY717 or PUAF717.
Formerly: PUAF717.

PLCY720 International Security Policy (3 Credits)
Reviews the principal features of international security as currently practiced. Traces the evolution of contemporary policy beginning with the initiation of nuclear weapons programs during World War II. Particular emphasis is given to experience of the United States and Russia, since the historical interaction between these two countries has disproportionately affected the international security conditions that all other countries now experience.
Restriction: Must be in a major in PLCY-School of Public Policy; or permission of PLCY-School of Public Policy.
Credit Only Granted for: PLCY720 or PUAF720.
Formerly: PUAF720.

PLCY722 Terrorism and Democracy (3 Credits)
United States government's decision process for dealing with crises; the options available to a president for deterring and handling incidents of terrorism, and how a president can and should select between the options.
Restriction: Must be in a major in PLCY-School of Public Policy; or permission of PLCY-School of Public Policy.
Credit Only Granted for: PLCY722 or PUAF722.
Formerly: PUAF722.

PLCY724 Problems of Global Security (3 Credits)
Explores the international security implications of globalization, presenting evidence indicating that altered circumstances will eventually induce a major redesign of prevailing security arrangements. Includes three segments: 1) a review of the principal problems that have been the focus of established security policy and would be the context for any major adjustment of policy; 2) an assessment of relationships with the major countries where traditional problems are most acutely present; and 3) a review of the organizing principles that can be expected to emerge in the new situation.
Restriction: Must be in a major in PLCY-School of Public Policy; or permission of PLCY-School of Public Policy.
Credit Only Granted for: PLCY724 or PUAF724.
Formerly: PUAF698W and PUAF724.

PLCY732 Policy and Politics of Education Reform (3 Credits)
Examines education reform in its historical, fiscal, cultural, and lega contexts, and the changing relationship between education and economic opportunity. Focuses on institutional and normative issues, including national standards, public school choice, charter schools, vouchers and funding equity.
Restriction: Must be in a major in PLCY-School of Public Policy; or permission of PLCY-School of Public Policy.
Credit Only Granted for: PLCY732 or PUAF732.
Formerly: PUAF732.

PLCY734 Foundations of Social Policy (3 Credits)
Provides an overview of government's role in social policy and the history of the development of federal and state policies with respect to welfare, aging, education, and housing. Analyzes current federal institutions and legislation in the same policy areas and the demographic history of the United States. Develops skills in analytic writing and presentation of descriptive data.
Restriction: Must be in a major in PLCY-School of Public Policy.
Credit Only Granted for: PLCY734 or PUAF734.
Formerly: PUAF734.

PLCY735 Health Policy (3 Credits)
Analyzes the origins, history, status, and future of health care as problems in political and economic theory and as puzzles in policy formation. Considers current American reform controversies in the light of several disciplines and in comparison to foreign experiences and structures.
Credit Only Granted for: PLCY735 or PUAF735.
Formerly: PUAF735.

PLCY736 Managing Social Services (3 Credits)
Focuses on managing social services across federal, state, and local jurisdictions with an emphasis on how strong management can improve results. Exposes students to management thought and philosophy as applied to different social services and social policy challanges within various operating environments and programmatic settings. The watchwords for this course are "management" and "applied".
Restriction: Must be in a major in PLCY-School of Public Policy; or permission of PLCY-School of Public Policy.
Credit Only Granted for: PUAF736, PLCY736 or PUAF698V.
Formerly: PUAF698V and PUAF736.

PLCY740 Public Policy and the Environment (3 Credits)
Surveys of major federal environmental legislation; the development and implementation of laws, and alternative ways of thinking about the relationship between humans and the environment.
Restriction: Must be in a major in PLCY-School of Public Policy; or permission of PLCY-School of Public Policy.
Credit Only Granted for: PLCY740 or PUAF740.
Formerly: PUAF740.

PLCY741 Global Environmental Problems (3 Credits)
Suitability of analytic tools for examining global environmental problems, human overpopulation, land abuse, ozone depletion, climate change, acid rain, loss of biological diversity, the scarcity of food, fresh water, energy and nonfuel mineral resources, and health hazards of pollutants toxic metals and radiation.
Restriction: Must be in a major in PLCY-School of Public Policy; or permission of PLCY-School of Public Policy.
Credit Only Granted for: PLCY741 or PUAF741.
Formerly: PUAF741.

PLCY742 Environmental Ethics (3 Credits)
Analyzes issues such as the relation between human beings and nature from the perspectives of the science, history, philosophy, and religion. Considers the bases for policies such as environmental regulation, public lands, and international conventions with respect to the environment.
Restriction: Must be in a major in PLCY-School of Public Policy; or permission of PLCY-School of Public Policy.

PLCY743 Ecological Economics (3 Credits)
Explores how taking account of the economic system's fundamental dependence on the environment alters conventional economic goals, priorities, theories, and prescriptions.
Restriction: Must be in a major in PLCY-School of Public Policy; or permission of PLCY-School of Public Policy.
Credit Only Granted for: PLCY743 or PUAF743.
Formerly: PUAF743.

PLCY744 Environment and Development (3 Credits)
Analyzes sustainable development and its conflicting interpretations. The dominant view, as expressed in the World Bank's 1992 World Development Report, is studied, along with some critical responses. Further readings on issues of population, consumption and development indicators.
Credit Only Granted for: PLCY744 or PUAF744.
Formerly: PUAF744.

PLCY745 Human Health and Environmental Policy (3 Credits)
Reviews the major human physiological systems and their integrated toxicological functions; considers key bodily defenses; and discusses classic, emerging, and ambiguous risks; in all ecological context. Applies to scientific controversy, the methods of policy formation, such as risk analysis, social-cost analysis, "outcomes" analysis, and decision analysis, all in political-economic context.
Credit Only Granted for: PLCY745 or PUAF745.
Formerly: PUAF745.

PLCY746 Dynamic Modeling for Environmental Investment and Policy Making (3 Credits)
Examines the theory, methods and tools to dynamic modeling for policy and investment decision making, with special focus on environmental issues. Provides extensive hands-on modeling experience and makes use of state-of-art computing methods to translate theory and concepts into executable models.
Restriction: Must be in a major in PLCY-School of Public Policy; or permission of PLCY-School of Public Policy.
Credit Only Granted for: PLCY746 or PUAF746.
Formerly: PUAF698M and PUAF746.

PLCY752 Managing Differences:Resolving Conflict and Negotiating Agreements (3 Credits)
Enhances the student's negotiation and leadership skills for managing differences between individuals and groups. Students study the nature of conflict, learn how to handle two and multiparty conflicts, exerting leadership where there are no hierarchy leaders, and explore the impact of facilitators and mediators on the negotiating process. Blends skill building exercises and theory discussions about the behavior of groups and individuals in groups to understand negotiation dynamics.
Restriction: Must be in a major in PLCY-School of Public Policy; or permission of PLCY-School of Public Policy.
Credit Only Granted for: PLCY752 or PUAF752.
Formerly: PUAF752.

PLCY753 Advanced Negotiations (3 Credits)
Deepens the student's negotiation and leadership skills for managing differences between individuals and groups. Cover conflict, escalation, dealing with intractable conflicts, sustaining agreements in inter-group conflicts, and the effects of trauma on negotiations.
Prerequisite: PUAF752.
Credit Only Granted for: PUAF698C, PUAF753 or PLCY753.
Formerly: PUAF698C and PUAF753.

PLCY770 Seminar in Housing and Community Development Strategies (3 Credits)
Detailed examination of community and social policy issues relating to the construction and management of affordable housing.
Restriction: Must be in a major in PLCY-School of Public Policy.
Credit Only Granted for: PLCY770 or PUAF770.
Formerly: PUAF770.

PLCY771 Housing and Community Development Overview (3 Credits)
An overview of the housing development process. Community development context, financial analysis, analytical tools including microcomputer applications, architectural and design issues, engineering constraints.
Restriction: Must be enrolled in the executive training program sponsored by the Department of Housing and Urban Development.
Credit Only Granted for: PLCY771 or PUAF771.
Formerly: PUAF771.

PLCY772 Housing Finance (3 Credits)
Fundamentals of housing investment analysis. Structuring feasibility analyses, appraisals, pro forma statements, return on investment, leverage analysis, underwriting ratios, taxation and syndication.
Restriction: Must be enrolled in the executive training program sponsored by the Department of Housing and Urban Development.
Credit Only Granted for: PLCY772 or PUAF772.
Formerly: PUAF772.

PLCY773 Housing Clinic (3 Credits)
Issues and strategies applicable to urban, suburban, and rural areas. Field experience and a team exercise, using the case study method, will give an opportunity for concrete application of the concepts to a specific set of community problems.
Restriction: Must be enrolled in the executive training program sponsored by the Department of Housing and Urban Development.
Credit Only Granted for: PLCY773 or PUAF773.
Formerly: PUAF773.

PLCY774 Asset Management (3 Credits)
Asset manager's role at each stage of the property's life cycle and property analysis, including cash flow debt and staffing. Topics include capital needs; major building systems, costs and useful lives; marketing and outreach; and anti-crime strategies. Field trips to problem properties to perform cost/benefit analysis, diagnose potential cures, and prepare action plans.
Restriction: Must be enrolled in the executive training program sponsored by the Department of Housing and Urban Development.
Credit Only Granted for: PLCY774 or PUAF774.
Formerly: PUAF774.

PLCY780 The American Foreign Policy-Making Process (3 Credits)
Survey and analysis of the governmental institutions and processes which shape U.S. global engagement on national security and international economic issues. Particular emphasis is given to executive-congressional relations and the broader domestic roots of foreign policy.
Restriction: Must be in a major in PLCY-School of Public Policy; or permission of PLCY-School of Public Policy.
Credit Only Granted for: PLCY780 or PUAF780.
Formerly: PUAF780.

PLCY781 International Economic Policy (3 Credits)
Issues and choices facing the United States in today's global economy. Primary, but not exclusive, emphasis is given to "competitive interdependence" among advanced industrial societies.
Restriction: Must be in a major in PLCY-School of Public Policy; or permission of PLCY-School of Public Policy.
Credit Only Granted for: PLCY781 or PUAF781.
Formerly: PUAF781.

PLCY782 International Development Economics (3 Credits)
Examines key current economic and policy issues for developing and transition economies. Topics include inflation stabilization, fiscal policy, selected trade issues, dealing with international capital flows, the role of multilateral organizations, such as the International Monetary Fund and the World Bank, and issues relating to saving, investment and growth.
Restriction: Must be in a major in PLCY-School of Public Policy; or permission of PLCY-School of Public Policy.
Credit Only Granted for: PUAF698U, PUAF782 or PLCY782.
Formerly: PUAF698U and PUAF782.

PLCY783 Development and Foreign Aid (3 Credits)
Examines the empirical, conceptual, and ethical dimensions of international development policies and U.S. foreign aid. What is the present character of development in poor countries/regions? How should development be conceived? What development strategies are best? What is and should be the purpose of U.S. foreign aide and development assistance?
Restriction: Must be in a major in PLCY-School of Public Policy; or permission of PLCY-School of Public Policy.
Credit Only Granted for: PLCY783 or PUAF783.
Formerly: PUAF698Q and PUAF783.

PLCY784 Disease, Disaster, and Development (3 Credits)
Studies development, the process by which needy people in fragile societies become self-sufficient people in resilient societies, in relation to disease and disaster, with particular attention to the developed world's response.
Credit Only Granted for: PUAF699D, PUAF784 or PLCY784.
Formerly: PUAF699D and PUAF784.

PLCY790 Project Course (3 Credits)
Students work at a sponsoring government agency or private firm researching problem of interest to sponsor and relevant to concentration. Emphasis on problem definition, organizing information, and both oral and written presentation of results.
Restriction: Must be in a major in PLCY-School of Public Policy; or permission of PLCY-School of Public Policy.
Credit Only Granted for: PLCY790 or PUAF790.
Formerly: PUAF790.

PLCY798 Readings in Public Policy (1-3 Credits)
Guided readings for discussions on public policy.
Restriction: Must be in a major in PLCY-School of Public Policy; or permission of PLCY-School of Public Policy.
Credit Only Granted for: PLCY798 or PUAF798.
Formerly: PUAF798.

PLCY898 Pre-Candidacy Research (1-8 Credits)
Credit Only Granted for: PLCY898 or PUAF898.
Formerly: PUAF898.

PLCY899 Doctoral Dissertation Research (1-8 Credits)
Restriction: Must be in a major in PLCY-School of Public Policy; or permission of PLCY-School of Public Policy.
Credit Only Granted for: PLCY899 or PUAF899.
Formerly: PUAF899.

PLSC - Plant Sciences

PLSC400 Plant Physiology (4 Credits)
An in-depth examination of the unique molecular and physiological principles necessary to understand how plants grow and respond to the environment at the cellular and organismal levels. Plants evolved unique metabolism and survival strategies, so students should be prepared to enter a world that may be new to them.
Prerequisite: Minimum grade of C- in BSCI170 and BSCI171; or minimum grade of C- in PLSC201; and minimum grade of C- in CHEM231 and CHEM232; or minimum grade of C- in CHEM237.
Cross-listed with: BSCI442.
Credit Only Granted for: BSCI442 or PLSC400.

PLSC401 Pest Management Strategies for Turfgrass (3 Credits)
Interdisciplinary view of weed, disease, and insect management from an agronomy perspective. Plant responses to pest invasion, diagnosis of pest-related disorders, and principles of weed, disease and insect suppression through cultural, biological and chemical means are discussed.
Prerequisite: PLSC305.

PLSC402 Sports Turf Management (3 Credits)
Sports turf management, including design, construction, soil modification, soil cultural techniques, pesticide use, fertilization, and specialized equipment.
Prerequisite: PLSC305 and PLSC401.

PLSC404 Plant and Fungal Metabolism (3 Credits)
An introduction to biochemistry and metabolism in plants and fungi, covering the biosynthesis of compartments in plant and fungal cells with biological molecules such as nucleic acids, amino acids and lipids. Energy flow processes such as photosynthesis, carbohydrate metabolism and respiration, are covered in the course. The integration of different pathways in plant development and responses to environmental stresses will be discussed.
Prerequisite: Minimum grade of C- in BSCI170 and BSCI171; or minimum grade of C- in PLSC201 and PLSC206.

PLSC405 Agroecology (3 Credits)
How can we balance the multiple, and often competing objectives of sustainable agricultural intensification to promote both agricultural productivity and human wellbeing? The answer to this question requires a transdisciplinary, agroecological perspective. Agroecology is the integrative study of the ecology of the entire food system, encompassing ecological, economic and social dimensions. This course is designed to introduce various topics in agroecology (e.g. organic agriculture, biodiversity, the Farm Bill). We will take an ecosystems approach to the study of agriculture that will enable students to analyze the environmental, social, and economic interconnections within various types of agricultural systems locally and globally.
Prerequisite: At least one course in ecology with a minimum grade of C-; or permission of instructor.
Recommended: BSCI361 or PLSC471; or any BSCI or ENST ecology course.
Credit Only Granted for: PLSC405 or PLSC605.
Additional Information: Class will be held on campus, with two day-long field trips to local farms.

PLSC410 Commercial Turf Maintenance and Production (3 Credits)
Agronomic programs and practices used in hydroseeding, commercial lawn care, sod production and seed production. Current environmental, regulatory and business management issues confronting the turfgrass industry.
Prerequisite: PLSC305; or permission of AGNR-Plant Science & Landscape Architecture department.

PLSC411 Plant Genetics (3 Credits)
An introduction to genetic principles and technologies in plants, centered on linking phenotype to genotype. Topics include Mendelian inheritance of single and complex traits, epigenetics, population genetics and plant breeding. Examples on creating and mapping genetic mutations in both model plants and non-model crops are discussed. Current genetic and genomic approaches are highlighted, such as genome engineering and reprogramming, TILLING, and genome-wide association mapping.
Prerequisite: Minimum grade of C- in BSCI170 and BSCI171.

PLSC420 Principles of Plant Pathology (4 Credits)
An introduction to the causal agents, nature and management of plant diseases with particular attention paid to economically important diseases of horticultural and agronomic crops.
Prerequisite: Minimum grade of C- in CHEM131, CHEM132, and PLSC201; or students who have taken courses with comparable content may contact the department.

PLSC425 Green Roofs and Urban Sustainability (1 Credit)
The integration of disciplines associated with sustainability issues. Topics range from plant science to design to policy, all of which can contribute to improving the urban environment.
Credit Only Granted for: PLSC425 or PLSC489V.
Formerly: PLSC489V.

PLSC427 Plant Microbe Associations (3 Credits)
Encompasses advanced investigation and analyses of the ecology, physiology and molecular genetics of plant-microbe interactions along with their impact on crop production, ecological and food production systems.
Credit Only Granted for: PLSC489W or PLSC427.
Formerly: PLSC489W.

PLSC430 Water and Nutrient Planning for the Nursery and Greenhouse Industry (3 Credits)
Skills will be developed in order to write nutrient management plans for the greenhouse and nursery industry. Completion of this course can lead to professional certification in nutrient planning by the State of Maryland after MDA examinations are passed.
Prerequisite: Minimum grade of C- in CHEM131 and CHEM132; or minimum grade of C- in ENST200; or permission of instructor.
Recommended: PLSC432.

PLSC432 Greenhouse Crop Production (3 Credits)
The commercial production and marketing of ornamental plant crops under greenhouse, plastic houses and out-of-door conditions. Integrating an understanding of basic plant physiological mechanisms into the decision-making process for the design, construction, maintenance and day-to-day management of greenhouse operations.
Prerequisite: Minimum grade of C- in PLSC201 .

PLSC433 Technology of Fruit and Vegetable Production (4 Credits)
A critical analysis of research work and application of the principles of plant physiology, chemistry and botany to practical problems in the commercial production of fruit and vegetable crops.
Prerequisite: Minimum grade of C- in PLSC201, PLSC271, and ENST200; or students who have taken courses with comparable content may contact the department.
Restriction: Junior standing or higher.

PLSC434 The Quest for Color (3 Credits)
Finding sources of color in nature has motivated mindful inquiry and technical innovation across cultures. Yet, the quest for new colors has been both a result of and an excuse for colonization, appropriation of indigenous knowledge, and enslavement. When natural dyestuffs were largely replaced by synthetic dyes derived from coal tar in the late 1800s, color development posed new ecological and cultural challenges. In spite of these threats, practitioners worldwide have maintained their traditional methods without exploitation or petroleum products. This course integrates the history and chemistry of dye materials from plants and insects with hands-on practice in sustainable color creation. Students will hone the practical skills needed to source and process foraged dye materials, and apply them sustainably to fibers. Via this scientific process students will gain insight into the benefits of a naturally sourced approach to color and to life.
Credit Only Granted for: PLSC434 or HONR218R.
Formerly: HONR218R.

PLSC452 Environmental Horticulture (3 Credits)
Environmental horticulture principles used in the establishment and maintenance of plant materials in residential and commercial landscapes will be addressed. The effect of soil conditions, environmental factors, and commercial practices will be discussed in relation to the growth and development of newly-installed plant materials. Field diagnostics will be used by students to assess significant problems of plant decline. Environmental sustainability will be combined with current commercial practices of storm water management, nutrient management, and irrigation management to achieve an integrated approach to plant management.
Prerequisite: Minimum grade of C- in PLSC110 and PLSC111; or minimum grade of C- in PLSC112 and PLSC113; and minimum grade of C- in PLSC253 and PLSC254.

PLSC453 Weed Science (3 Credits)
Weed identification, ecology, and control (cultural, mechanical, biological, and chemical methods).

PLSC460 Application of Knowledge in Plant Sciences (3 Credits)
A capstone course based on interactions with plant science professionals and student-led class discussions. Students will apply their knowledge and experience to practical issues in the discipline, further develop critical thinking ability, and enhance their communication, teamwork, and professional skills. Topics will include nutrient management, integrated pest management, plant interactions with urban and rural ecosystems, planning of public grounds, plant biotechnology, and teaching skills.
Prerequisite: Minimum grade of C- in PLSC110 and PLSC111; or minimum grade of C- in PLSC112 and PLSC113; or minimum grade of C- in PLSC201; or permission of instructor.
Recommended: ENGL393 and ENST200; and (PLSC389 or PLSC399).
Restriction: Senior standing or higher.

PLSC461 Cultural Management of Nursery and Greenhouse Systems: Substrates (1 Credit)
One of three 1-credit modules (PLSC461, PLSC462 and PLSC464)covering the management techniques used in the intensive culture of plants in commercial operations. Specifically, this module covers the composition, handling, physical and chemical properties of substrates and how they should be managed to maximize plant growth.
Credit Only Granted for: PLSC461 or PLSC489T.
Formerly: PLSC489T.
Additional Information: Course material is delivered primarily online, but a four hour face-to-face lecture/lab will be held at the end of the module. PLSC461, PLSC462 and PLSC464 will be taught sequentially during the semester.

PLSC462 Cultural Management of Nursery and Greenhouse Systems; Irrigation (1 Credit)
One of three 1-credit modules (PLSC461, PLSC462 and PLSC464) covering the management techniques used in the intensive culture of plants in commercial operations. Specifically, this module covers water quantity and quality issues, water supply (basic hydraulics), irrigation system design and irrigation system evaluation (performance) to maximize water application efficiency.
Credit Only Granted for: PLSC462 or PLSC489W.
Formerly: PLSC489W.
Additional Information: Course material is delivered primarily online, but a four hour face-to-face lecture/lab will be held at the end of the module. PLSC 461, 462 and 464 will be taught sequentially during the semester.

PLSC464 Cultural Management of Nursery and Greenhouse Systems: Nutrients (1 Credit)
One of three 1-credit modules (PLSC461, PLSC462 and PLSC464) covering the management techniques used in the intensive culture of plants in commercial operations. Specifically, this module covers the basics of fertilization, different fertilization strategies and nutrient use and efficiency, to optimize nutrient application practices in intensive plant production systems.
Credit Only Granted for: PLSC464 or PLSC489Z.
Formerly: PLSC489Z.
Additional Information: Course material is delivered primarily online, but a four hour face-to-face lecture/lab will be held at the end of the module. PLSC 461, 462 and 464 will be taught sequentially during the semester.

PLSC471 Forest Ecology (3 Credits)
An understanding of the forest ecosystem, its structure and the processes that regulate it are provided. It also considers changes that occur in forests, the interaction of environment and genetics in promoting ecosystem sustainability, and the role of human influences on urban forest ecosystems.
Prerequisite: Minimum grade of C- in PLSC201; or minimum grade of C- in BSCI160 and BSCI161; or minimum grade of C- in BSCI106.

PLSC472 Capstone-Urban Forest Project Management (3 Credits)
Students will synthesize the ideas and information learned from their studies in urban forestry. Working in teams, students will complete projects involving real-world issues. Student projects will use scientific, social, political and ethical considerations in an interdisciplinary approach to provide solutions to their problem.
Prerequisite: Minimum grade of C- in ENST200, PLSC272, and PLSC471.
Restriction: Senior standing or higher; and must be in a major within AGNR-Plant Science & Landscape Architecture department.

PLSC473 Woody Plant Physiology (3 Credits)
Concentration is placed on physiological processes important to woody plant growth and development. Emphasis will be placed on current concepts and theories of how woody plants grow and develop, and the critical assessment of current research in woody plant physiology. Course readings will include textbook assignments and selected papers from the current scientific literature.
Prerequisite: Minimum grade of C- in PLSC400 or BSCI442; or minimum grade of C- in PLSC201 and PLSC206; or students who have taken courses with comparable content may contact the department.

PLSC476 Data Wrangling and Visualization Using R (3 Credits)
Through a combination of lecture, hands-on demos, quizzes, and increasingly independent coding exercises and a project, you will learn the fundamentals of using the R statistical language. You will gain experience getting your data into R, wrangling it into the form needed for your chosen analysis, visualizing the data, getting your results out of those analyses, and documenting your workflow greater scientific community. Instead of focusing on a few specific types of analyses, you will learn basic skills and general principles that you can use to analyze data for your field.
Credit Only Granted for: PLSC489R or PLSC476 .
Formerly: PLSC489R.

PLSC480 Urban Ecology (3 Credits)
Cities are rapidly increasing in number and size across the globe, transforming local ecosystems. This course examines urban environments as coupled social-ecological systems at multiple scales, from streets and parks to urban landscapes patterns and global patterns of biodiversity. Ecological principles are applied in the urban context, including habitats, biodiversity, ecological processes, and ecosystem services of urban environments, with applications to problems in urban land management, decision-making and design.
Prerequisite: Minimum grade of C- in PLSC471, ENST360, BSCI363, or BSCI160; or other coursework/experience considered for instructor permission.
Additional Information: Class will be held both on campus and at other locations such as the U.S. Botanic Garden, local parks, and urban and suburban locations off campus.

PLSC481 Vegetation Assessment and Analysis (2 Credits)
An overview of vegetation assessment through the collection of data in the field (e.g. plots and transects) and the analysis of existing data and remotely detected images (e.g. Aerial photographs and GIS layers).
Prerequisite: PLSC110 and PLSC111; or (BSCI160 and BSCI161); or permission of instructor.
Recommended: PLSC201, BSCI360, PLSC226, or PLSC471.

PLSC489 Special Topics in Plant Science (1-3 Credits)
A lecture and or laboratory series organized to study a selected phase of Plant Science not covered by existing courses. Credit according to time scheduled and organization of the course.
Repeatable to: 6 credits if content differs.

PLSC602 Advanced Crop Breeding II (2 Credits)
Quantitative inheritance in plant breeding including genetic constitution of a population, continuous variation, estimation of genetic variances, heterosis and inbreeding, heritability, and population movement.
Prerequisite: PLSC601; and must have completed a graduate statistics course.

PLSC605 Advanced Agroecology (3 Credits)
How can we balance the multiple, and often competing objectives of sustainable agricultural intensification to promote both agricultural productivity and human wellbeing? The answer to this question requires a transdisciplinary, agroecological perspective. Agroecology is the integrative study of the ecology of the entire food system, encompassing ecological, economic and social dimensions. This course is designed to introduce various topics in agroecology (e.g. organic agriculture, biodiversity, the Farm Bill). We will take an ecosystems approach to the study of agriculture that will enable students to analyze the environmental, social, and economic interconnections within various types of agricultural systems locally and globally. Students will be required to plan and execute group discussions and learning activities.
Prerequisite: At least one course in ecology with a minimum grade of C-; or permission of instructor.
Recommended: BSCI361 or PLSC471; or any BSCI or ENST ecology course.
Additional Information: Class will be held on campus, with two day-long field trips to local farms.

PLSC608 Research Methods (2 Credits)
An overview of research methods and applications related to plant sciences. Topics covered include current research advances, professional conduct and ethics, and preparation of grant proposals, manuscripts, and scientific presentations.
Prerequisite: Permission of AGNR-Plant Science & Landscape Architecture department.
Repeatable to: 6 credits if content differs.
Credit Only Granted for: AGRO608, NRSC608, or PLSC608.
Formerly: NRSC608.

PLSC609 Integrated Pest Management (1-4 Credits)
A modular course with an interdisciplinary approach to the theory and practice of integrated pest management. Topics of modules, each 3-4 weeks long, vary each semester over a three year time frame, with the first module serving as a prerequisite for all other modules. See www.EntmClasses.umd.edu for description of modules.
Restriction: Permission of instructor.
Repeatable to: 10 credits if content differs. Cross-listed with ENTM609.
Credit Only Granted for: ENTM609, NRSC609, or PLSC609.
Formerly: NRSC609.

PLSC618 Advances in Research; Critiquing Primary Plant Science Literature (1 Credit)
Discussion of advances in plant science research based on classic and current scientific literature.
Repeatable to: 7 credits.

PLSC619 Seminars in Plant Science and Landscape Architecture (1 Credit)
Enhancement of student learning and enrichment of student curriculum for the Plant Science Graduate Program through a combination of research seminar attendance and post-seminar discussion. Research seminars will be given by prominent scientists in the field of plant sciences and post-seminar discussions will be facilitated by the instructor along with student discussion leaders.
Repeatable to: 7 credits if content differs.

PLSC682 Methods of Plant Science Research (4 Credits)
The application of biochemical and biophysical methods to problems in biological research with emphasis on plant materials.
Credit Only Granted for: HORT682, NRSC682, or PLSC682.
Formerly: NRSC682.

PLSC685 Advanced Plant Ecophysiology (3 Credits)
Growth, productivity and survival are intimately linked to a plant's ability to adjust to its environment. The information provided in this course is designed to provide an introduction to the basic physical and psysiological principles necessary for understanding the interactions between plants and their environment. The overall objective of this course is to understand plant responses and adaptations to the environment and the ecological relevance of these responses.
Prerequisite: Must have completed one course in plant physiology.
Credit Only Granted for: NRSC685 or PLSC685.
Formerly: NRSC685.

PLSC689 Special Topics (1-3 Credits)
Credit according to time scheduled and organization of the course. Organized as a lecture series on a specialized advanced topic.
Repeatable to: 6 credits if content differs.
Credit Only Granted for: HORT689, NRSC689, or PLSC689.
Formerly: NRSC689.

PLSC782 Physiology, Biochemical and Molecular Biology of Herbicides and Plant Growth Regulators (3 Credits)
In this class we will study natural and synthetic chemicals which regulate the growth and development of plants. The mechanism by which herbicides and plant growth regulators express their activity on plants and the impact of these chemicals on the environment will be a primary focus of this course. The interaction of these chemicals with biotechnology advances will also be examined.
Prerequisite: Minimum grade of C- in PLSC400 or BSCI442.

PLSC785 Advanced Post-Harvest Physiology (3 Credits)
Physiological, biochemical and molecular aspects of senescence of detached plant organs, such as fruits, leaves and flowers.
Prerequisite: Minimum grade of C- in PLSC474 and BCHM461; or permission of AGNR-Plant Science & Landscape Architecture department.

PLSC789 Advances in Research (1 Credit)
Discussion of advances in plant science research based on classic and current scientific literature.
Repeatable to: 7 credits if content differs.
Credit Only Granted for: AGRO789, NRSC789, or PLSC789.
Formerly: NRSC789.

PLSC798 Graduate Seminar (1 Credit)
First and second semester.
Repeatable to: 6 credits if content differs.
Credit Only Granted for: AGRO798, HORT798, NRSC798, or PLSC798.
Formerly: NRSC798.

PLSC799 Master's Thesis Research (1-6 Credits)

PLSC802 Epidemiology and Plant Disease Management (3 Credits)
An in-depth advanced course for graduate students in plant pathology, agronomy, entomology and horticulture emphasizing the principles of effective plant disease management in the agroecosystem.

PLSC805 Advanced Crop Physiology (2 Credits)
Major emphasis will be on physiological processes affecting yield and productivity of major food fiber and industrial crops of the world. Topics such as photosynthesis, respiration, photorespiration, nitrogen metabolism will be related to crop growth as affected by management decisions. Topics of discussion will also include growth analysis and the use of computer modeling of crop growth by plant scientists.
Prerequisite: Minimum grade of C- in PLSC400; or minimum grade of C-in BSCI442; and must have completed advanced training in plant sciences.

PLSC898 Pre-Candidacy Research (1-8 Credits)

PLSC899 Doctoral Dissertation Research (1-8 Credits)

PORT - Portuguese

PORT405 Portuguese for Spanish Speakers (3 Credits)
Intensive basic grammar, reading and auditory comprehension. Native or acquired fluency in Spanish required.
Restriction: Must have native or acquired fluency in Spanish.

PORT408 Special Topics in Portuguese Literature (3 Credits)
Major themes and literary developments from the late 18th century to the present.
Repeatable to: 6 credits if content differs.

PORT409 Special Topics in Brazilian Literature (3-6 Credits)
Major themes and literary development from the late eighteenth century to the present. Specific topic to be announced each time the course is offered.

PORT410 Tropical Dreams: Nature and Art in Brazil (3 Credits)
Ideas, images, and representations of the tropics have historically portrayed them as exotic, lush, underdeveloped, and resource-rich places. This course interrogates how concepts of tropicality and nature have influenced the culture, politics, and society of a particular country: Brazil. We examine how nature, a key concept in tropicality, has been represented and understood in different terms throughout history and how these representations have informed environmental discourses and attitudes. Furthermore, we critically analyze how racialized notions of the tropics that shaped structures of oppression have been constructed, perpetuated, and contested. Our objects of analysis will consist of artistic depictions of the tropical world in addition to films, music, literature, and critical thought.
Credit Only Granted for: PORT409A, SPAN609A, LACS448Y, or PORT410.
Formerly: PORT409A.

PORT478 Themes and Movements of Luso-Brazilian Literature in Translation (3 Credits)
A study of specific themes and movements either in Portuguese or Brazilian literature, as announced. Designed for students for whom the literatures would be inaccessible in Portuguese.
Repeatable to: 6 credits if content differs.

PORT480 Machado de Assis (3 Credits)
Fiction of Machado de Assis covering his romantic and realistic periods.
Prerequisite: Permission of ARHU-School of Languages, Literatures, and Cultures department.

PORT609 Special Topics - Brazilian Literature (3-6 Credits)
Representative topics/authors/works of Brazilian literature. Texts in Portuguese: classes conducted in Portuguese and Spanish.
Prerequisite: Must have reading knowledge of Portuguese - fluency in Spanish or Portuguese.
Repeatable to: 6 credits if content differs.

PORT699 Independent Study of Portuguese (1-3 Credits)
This course is designed to provide graduate students an opportunity to pursue independent study under the supervision of a member of the department.
Repeatable to: 3 credits.

PSYC - Psychology

PSYC401 Biological Bases of Behavior Laboratory (4 Credits)
Students will study some of the key concepts in neuroscience by combining behavioral experiments with electrode recordings from neurons controlling the behaviors. We will intensively examine concepts like creation of rhythmic behaviors (walking, flight), neurotransmitters' control of aggression, drug effects on synaptic activity, high-speed neural circuits for effective escape from predators, and CNS maps in the visual system for directing prey capture. Students will learn microsurgery and a broad range of neural recording techniques. We work with animals (invertebrates, cold-blooded vertebrates) every week. A strong biology background will be beneficial.
Prerequisite: PSYC300; and (PSYC202, NEUR200, or BSCI353).
Restriction: Permission of instructor; and must be in Psychology program; and must have earned a minimum of 85 credits.
Credit Only Granted for: PSYC401, NEUR405, BSCI455 or BSCI454.

PSYC403 Animal Behavior (3 Credits)
Reviews the theoretical framework underlying the study of animal behavior. The genetic, hormonal and physiological basis of behavior, and the relation to ecological and evolutionary processes will be discussed using examples that range from invertebrate animals to humans.
Prerequisite: PSYC202 or NEUR200.

PSYC404 Introduction to Behavioral Pharmacology (3 Credits)
Theoretical viewpoints on the interaction of drugs and behavior. Basic principles of pharmacology, the effects of drugs on various behaviors, experimental analysis of drug dependence and abuse, and neuropharmacology and behavior.
Prerequisite: PSYC202 or NEUR200.
Restriction: Must be in Psychology program.

PSYC406 Neuroethology (3 Credits)
A merger between the disciplines of neuroscience and ethology (animal behavior) studies the behavioral functions of nervous systems using a comparative and evolutionary approach. Students will learn how the nervous system controls behavioral patterns in a variety of different organisms ranging from insects to mammals.
Prerequisite: PSYC301, PSYC202 or NEUR200.
Restriction: Must be in Psychology program.

PSYC407 Behavioral Neurobiology Laboratory (4 Credits)
In this lab course, you will collect behavioral and physiological data in humans using classic behavioral paradigms, design models of neural circuits that can explain those behaviors, record neural activity from the roach, and write lab reports describing your results and how they relate to patients with psychiatric illnesses.
Prerequisite: PSYC300; and (PSYC202 or NEUR200).
Restriction: Must be in Psychology program; and must have earned a minimum of 85 credits.

PSYC409 Topics in Neurosciences Seminar (1 Credit)
Current research in neurosciences will be presented, read, and discussed. Emphasis will change each term.
Restriction: Permission of BSOS-Psychology department; and junior standing or higher.
Repeatable to: 4 credits if content differs.

PSYC411 Introduction to Functional Magnetic Resonance Imaging (3 Credits)
An introduction to functional magnetic resonance imaging (fMRI). Students will be taught about formulating testable hypotheses with fMRI, utilizing basic methods in fMRI studies, and understanding existing limitations of fMRI studies in the literature.
Prerequisite: PSYC200 and PSYC300; and (PSYC202 or NEUR200).
Restriction: Must be in the Psychology major or Neuroscience major.
Credit Only Granted for: NACS728F or PSYC411.

PSYC414 Science of Sleep and Biological Rhythms (3 Credits)
Sleep is a powerful, inescapable, misunderstood, and mysterious presence in our lives. The course will begin with a review of the basics of sleep and biological rhythms with a focus on the underlying neurobiology. The bulk of the semester will be in-depth discussions of topics in sleep and circadian rhythms primarily chosen by the students. A few examples: narcolepsy, sleep in primitive cultures, lucid dreaming, racial and cultural differences in sleep and sleep disorders, the biology of sleep and circadian rhythms during adolescence, CNS control of dreaming, sleep and states of consciousness, sleeping to remember vs. sleeping to forget, legal ramifications of parasomnias, e.g. sleepwalking, and the relationships between sleep deprivation and obesity.
Prerequisite: PSYC301, PSYC202, or NEUR200; or permission of instructor.
Restriction: Must be in a major within the BSOS-Psychology department; and restricted to psychology majors during the registration period.

PSYC416 Development of Attachment in Infancy and Childhood: Theory, Research, Methods, and Clinical Implications (3 Credits)
Overview of the development of attachment during infancy and childhood, examining theory, research methods, research findings, and clinical implications. Students will observe videos of attachment assessments, lead class discussion of readings, make class presentations, and complete writing assignments.
Prerequisite: PSYC355; or permission of instructor.
Restriction: Must be in a major within the BSOS-Psychology department.

PSYC417 Data Science for Psychology and Neuroscience Majors (4 Credits)
A large number of industry and academic jobs require basic programming and data analysis skills. This class represents an introduction to both. Students will learn to program in R and will briefly be introduced to Python, the two most popular programming languages for data science. Common constructs shared by a variety of procedural programming languages will be emphasized. Basic statistics and probability theory will be reviewed from a computational perspective, and more advanced topics introduced. During the course, students will simulate toy data sets which they will then analyze knowing how the data came about, as well as work with real data. The class is highly hands-on with a large number of in-class lab and homework projects. Expect to work a lot and move quickly. Because of the hands-on nature of the class, the overall focus is more on application and execution rather than theory. However, some theory is covered at a high level so that students are aware of why they are doing something, rather than mindlessly writing code.
Prerequisite: PSYC200 and PSYC300; and (MATH120, MATH130, or MATH140).
Credit Only Granted for: PSYC489D or PSYC417.
Formerly: PSYC489D.

PSYC420 Experimental Psychology: Social Psychology Laboratory (4 Credits)
A laboratory course to provide a basic understanding of experimental methods in social psychology and experience in conducting research on social processes.
Prerequisite: PSYC300 and PSYC221.
Restriction: Must be in Psychology program or Social Data Science - Psychology Track; and must have earned a minimum of 85 credits.

PSYC424 Communication and Persuasion (3 Credits)
Effect of social communication upon behavior and attitudes. Theory and research concerning attitude change and social influence.
Prerequisite: PSYC221 and PSYC200.

PSYC425 Psychology and Law (3 Credits)
An introduction to the intersection of psychology and the criminal justice system, known as the field of legal psychology. The material covered will span the course of the criminal justice process and examine each aspect from a psychological perspective beginning with profiling and moving on to eyewitness memory and judgements through perpetrator memories and interrogation techniques. These aspects will be evaluated with a research lens as well as an applied outlook.
Prerequisite: PSYC100, PSYC200, and PSYC300.
Restriction: Must be in Psychology program or Social Data Science - Psychology Track.
Credit Only Granted for: PSYC325 or PSYC425.

PSYC426 Psychology of Adolescents' Close Relationships: Parents, Peers, and Romantic Partners (3 Credits)
An examination of the development of close relationships during adolescence, including those with parents, peers, and romantic partners. We consider core developmental themes including nature and nurture, stability and change, and individual differences, and discuss theory, research, and clinical applications. Students gain observational skills through discussing extensive video examples of social interactions.
Prerequisite: PSYC355; or permission of the instructor.
Credit Only Granted for: PSYC426 or PSYC489B.
Formerly: PSYC489B.

PSYC431 Human and Animal Intelligence (3 Credits)
The study of intelligence touches upon a broad range of topics from cognition, animal behavior, philosophy, psychology, and linguistics. Through lectures, discussions, and critical evaluation of opposing arguments, we will investigate the construct of intelligence from an evolutionary perspective. An understanding of animal intelligence also has important applications for understanding cognition in general, the design of robotic controls, investigating human health, conserving endangered species, development of artificial intelligence, and assuring animal welfare.
Prerequisite: PSYC300.
Credit Only Granted for: PSYC431 or PSYC489R.
Formerly: PSYC489R.

PSYC432 Counseling Psychology: Theories, Research, and Practice (3 Credits)
Analysis of research and intervention strategies developed and used by counseling psychologists. Historical and current trends in content and methodology.
Prerequisite: PSYC200.

PSYC433 Basic Helping Skills: Research and Practice (4 Credits)
Theories and research regarding effective helping relationships, with a focus on applications to counseling and psychotherapy. Students will practice helping skills with each other and will conduct research projects evaluating their helping skills. Students should be willing to talk about personal issues in class. Attendance in labs is mandatory and contributes to the course grade; thus, students should only enroll in a lab section that they will be able to attend consistently.
Prerequisite: PSYC300.
Restriction: Must be in Psychology program; and must have earned a minimum of 85 credits; and must not have completed or be concurrently enrolled in EDCP 310.
Credit Only Granted for: EDCP210, EDCP310, or PSYC433.

PSYC435 Temperament, Personality, and Psychopathology (3 Credits)
An advanced review of cutting-edge research in humans and animals aimed at understanding the psychological and biological mechanisms underlying stable individual differences in temperament and personality (T&P) and determining their role in adult and child psychopathology, with a major focus on anxiety disorders, depression, and addiction. We will discuss the developmental origins of T&P, measurement issues, fundamental dimensions, heritability, relevance to psychopathology and intervention (treatment and prevention), and broader implications for public policy.
Prerequisite: PSYC200.

PSYC436 Introduction to Clinical Psychology: From Science to Practice (3 Credits)
Critical analysis of clinical psychology, with particular emphasis on current developments and trends.
Prerequisite: PSYC300.

PSYC437 The Assessment and Treatment of Addictive Behaviors (3 Credits)
Explores the current research in assessment and treatment of addictive behaviors. Topics may include addictions in the areas of alcohol, drugs, nicotine, gambling, and eating.
Prerequisite: PSYC100; and 9 credits in PSYC courses.

PSYC438 Special Topics in Study Abroad IV (1-6 Credits)
Special topics course taken as part of an approved study abroad program.
Repeatable to: 15 credits if content differs.

PSYC440 Experimental Psychology: Cognitive Processes and Legal Applications (4 Credits)
A survey of the content, models, and methods in cognitive psychology with an emphasis on attention and encoding, recall, recognition, judgment, signal detection theory, and applying cognitive theories to situations in the legal system. Students integrate scientific theories with real-life legal situations. Course topics include research methodology in assessing and addressing cognitive mechanisms and how this understanding may help eyewitness and victim recall and recognition, perpetrator recall, assessing scientific theories of repression, and real life examples.
Prerequisite: PSYC100, PSYC200, PSYC300 and PSYC341.
Restriction: Must be in Psychology program or Social Data Science - Psychology Track; and must have earned a minimum of 85 credits.

PSYC442 Psychology of Language (3 Credits)
Introductory survey of the psychology of language, focusing on the cognitive processes that enable us to produce and understand language. Topics include speech perception, speech production, syntactic processing, language development, language disorders, and the brain bases of language.
Prerequisite: PSYC300 and PSYC341.
Restriction: Must be in Psychology program.

PSYC447 Diversity in Organizations (3 Credits)
Overview and active discussion of issues related to diversity and discrimination in organizations from several different perspectives, including: the person(s) being stigmatized, the person(s) doing the stigmatizing, the bystander(s) witnessing stigmatization of others, and the organization. Course readings address each of these perspectives, along with an introductory unit that outlines key concepts of diversity.
Prerequisite: PSYC300.
Credit Only Granted for: PSYC489E or PSYC447.
Formerly: PSYC489E.

PSYC450 Applying Psychology to the Workplace: Industrial Organizational Psychology Laboratory (4 Credits)
In this laboratory course, students use data analytic techniques, along with psychology theories and principles, to solve problems and provide recommendations to mock organizations. Along with learning theories in industrial-organizational psychology and statistical analysis, students will improve personal presentation skills that promote effective communication of information.
Prerequisite: PSYC300.

PSYC460 Psychological Foundations of Personnel Selection and Training (3 Credits)
An examination of issues and processes involved in the design and evaluation of personnel selection and training programs in a variety of organizational settings: job, person and organizational analysis; organizational choice; development of predictors; evaluation of instructional and training systems; criteria for performance evaluation, promotion and training.
Prerequisite: PSYC361 and PSYC200.

PSYC464 Psychology of Leaders in Work Organizations (3 Credits)
The psychological assumptions and implications of various theories of management and leadership. Selections and training; development of careers; influence processes; change of managerial behavior; and the impact of the larger environment, nature of product or service, and organization structure on managerial behavior.
Prerequisite: PSYC200 and PSYC361.

PSYC468 Field Experience and Special Assignments in Honors (1-3 Credits)
An individual experience arranged by the honors student and his or her supervisor. A proposal submitted to the honors faculty in the semester preceding registration for the course should state the activities anticipated and the method of evaluation.
Prerequisite: Must have permission of supervisor and honors faculty.
Restriction: Permission of BSOS-Psychology department.
Repeatable to: 6 credits.

PSYC469 Honors Thesis Proposal Preparation (3 Credits)
Development of honors thesis proposal by preliminary research and literature review. Presentation of formal proposal to the thesis committee.
Restriction: Permission of BSOS-Psychology department.
Repeatable to: 3 credits.

PSYC478 Independent Study in Psychology (1-3 Credits)
Course credit related to independent study (IS) activity within the Department of Psychology, such as serving as a Teaching Assistant (TA) for a faculty member or graduate student.
Restriction: Permission of BSOS-Psychology department; and must have earned a minimum of 9 credits in Psychology; and must have earned a minimum GPA of 3.0 in Psychology; and minimum cumulative GPA of 2.8.
Repeatable to: 12 credits.

PSYC479 Special Research Problems in Psychology (1-3 Credits)
Course credit related to supervised research activity within the Department of Psychology, such as working as a Research Assistant (RA) for a faculty member or graduate student.
Restriction: Permission of BSOS-Psychology department; and must have earned a minimum of 9 credits in Psychology; and must have earned a minimum GPA of 3.0 in Psychology; and minimum cumulative GPA of 2.8.
Repeatable to: 12 credits.

PSYC488 Advanced Psychology I (Honors) (3 Credits)
Seminar covering topics in sensation, perception, learning, and motivation.
Prerequisite: PSYC200.
Restriction: Permission of BSOS-Psychology department.

PSYC489 Advanced Special Topics in Psychology (3 Credits)
Treatment of a specialized topic in psychology.
Prerequisite: PSYC300.
Repeatable to: 9 credits if content differs.

PSYC498 Advanced Psychology II (Honors) (1 Credit)
Seminar covering topics of current interest in psychology.
Prerequisite: Permission of BSOS-Psychology department.
Repeatable to: 3 credits.

PSYC499 Honors Thesis Research (3 Credits)
Prerequisite: PSYC469; and must have permission of thesis advisor.

PSYC601 Quantitative Methods I (4 Credits)
A basic course in quantitative/mathematical analysis and statistical methods in psychology with an emphasis on conceptual understanding. Topics include issues in measurement, probability theory, statistical inference and hypothesis testing, parameter estimation, bivariate regression, and correlation.
Prerequisite: PSYC200; or students who have taken courses with comparable content may contact the department.

PSYC602 Quantitative Methods II (4 Credits)
A continuation of PSYC 601. Topics include experimental design, analysis of variance, analysis of covariance, multiple regression, and general linear models.
Prerequisite: PSYC601.

PSYC603 Introduction to Industrial and Organizational Psychology (3 Credits)
Advanced survey of industrial-organizational psychology, including selection, training, motivation, group processes, leadership, organizational psychology, and organizational theory. Readings stressed and seminar time will be used for lectures, discussion and integration of the reading materials.
Credit Only Granted for: PSYC603 or PSYC730.
Formerly: PSYC730.

PSYC604 Fundamentals of Social Psychology (3 Credits)
A survey of classic and contemporary theories, research and methods in social psychology.
Credit Only Granted for: PSYC604 or PSYC640.
Formerly: PSYC640.

PSYC605 Multilevel Modeling (3 Credits)
Students are provided with an introduction to multilevel modeling techniques (also termed "hierarchical linear models," "mixed effects models," and "random coefficients models"), with an emphasis on applications. Specific topics that are covered include conceptualization and specification of multilevel models, interpretation of parameter estimates, and application in computer programs using existing datasets. Applications will include a) individuals nested within groups; b) repeated measures/idiographic analysis; c) dyadic studies; d) daily-diary studies; and e) growth-curve modeling. Readings and examples will be drawn from clinical psychology, cognitive psychology, developmental psychology, educational psychology, and social psychology. Students are encouraged to use their own research data for course assignments.
Credit Only Granted for: PSYC798A or PSYC605.
Formerly: PSYC798A.

PSYC606 Human Biopsychology (3 Credits)
An introductory graduate level course in human psychobiology designed for graduate students with little specific training in this area. Introduction to the comparative and evolutionary approach to the study of human behavior, the biobehavioral basis of human sexuality and social behavior, the physiological basis of higher cortical functions in humans including language, memory, and spatial perception, and an introduction to neuropharmacology.
Credit Only Granted for: PSYC606 or PSYC660.
Formerly: PSYC660.

PSYC607 Foundations of Cognition (2 Credits)
Covers major topic areas in the field of human learning and cognition, with emphasis on information processes, mental representations, memory, reasoning, problem solving, and language.
Credit Only Granted for: PSYC607 or PSYC798E.
Formerly: PSYC798E.

PSYC610 Historical Viewpoints and Current Theories in Psychology (3 Credits)
Origins of psychology in philosophy and the sciences; the development of psychology as a science in the nineteenth and twentieth centuries. A review of current theoretical perspectives and research in relation to the enduring issues in psychology. The role of culture, science, and technology in the development of psychological ideas.
Credit Only Granted for: PSYC610 or PSYC688.
Formerly: PSYC688.

PSYC611 Advanced Developmental Psychology (3 Credits)
Systematic exploration of contemporary and classic theories of development focusing on the assumptions they make and research they generate.

PSYC612 Affective Science Perspectives on Temperament & Personality (3 Credits)
Scientific requirements for a personality theory. Postulates and relevant research literature for several current personality theories.

PSYC614 Emotion: From Biological Foundations to Contemporary Debates in the Psychological Sciences (3 Credits)
Multidisciplinary exploration of the current state of our scientific understanding of emotional states and traits, their biological roots, and their relevance to psychiatric disease. We will cover foundational knowledge in neuroscience and genetics, strengths and weaknesses of widely used methods, classic and cutting-edge empirical work, and ongoing conceptual debates. We will also discuss crucial discrepancies between the ways in which scientists and laypeople conceptualize emotions. In addition to human neuroimaging and genomic-association studies, we will explore biological research that affords causal insights, including animal models, acute pharmacological challenges, neurofeedback, and brain stimulation approaches, and case studies of patients with circumscribed neural insults.

PSYC619 Research Team in Clinical Psychology (1-3 Credits)
Participation in ongoing faculty-student research teams focusing on discussion of research topics, presentation and critique of original research proposals, and development of thesis and dissertation research studies.
Repeatable to: 6 credits.

PSYC622 Research Methods in Clinical Psychology (3 Credits)
Examines issues and strategies in conceptual systems, designs and methodologies of current research in clinical and community psychology. Readings include critical analyses of published research. Course requirements include preparation of a research proposal for a thesis level study.
Restriction: Permission of instructor.
Credit Only Granted for: PSYC622 or PSYC718.
Formerly: PSYC718.

PSYC623 Child Development & Psychopathology (3 Credits)
Examines the scientific and clinical literature relevant to developmental aspects of behavior across the lifespan and normal and pathological behavior in children and adolescents. Issues in developmental psychology and developmental psychopathology and consideration of processes initiated in childhood that manifest as pathology in adulthood are also considered.
Restriction: Permission of instructor; and must be in one of the following programs (Psychology (Master's); Psychology (Doctoral)).

PSYC624 Adult Psychopathology (3 Credits)
Examines the scientific and clinical literature relevant to normal and pathological behavior in adults and associated nosological systems for categorizing psychopathology. Issues relevant to etiology, differential diagnosis, and treatment planning are also considered.
Restriction: Permission of instructor; and must be in one of the following programs (Psychology (Master's); Psychology (Doctoral)).
Credit Only Granted for: PSYC624 or PSYC719.
Formerly: PSYC719.

PSYC625 Clinical Assessment: Psychometric Principles, Testing and Behavior (3 Credits)
An examination of fundamental principles of psychological assessment; application of these principles to the development of evidence-based assessments of clinical conditions and associated behaviors; and application of evidence-based assessments to the evaluation and understanding of clinical conditions evaluated and treated in therapeutic settings.
Restriction: Permission of BSOS-Psychology department.
Credit Only Granted for: PSYC625 or PSYC721.
Formerly: PSYC721.

PSYC628 Advanced Topics in Clinical Psychology (1-3 Credits)
Examines selected topics in clinical/community psychology, public policy and health care planning.
Restriction: Permission of instructor.
Repeatable to: 9 credits if content differs.
Credit Only Granted for: PSYC628 or PSYC719.
Formerly: PSYC719.

PSYC629 Clinical Laboratory (1-3 Credits)
Provides advanced supervised experience in the delivery and supervision of mental health interventions targeted to individuals. Supervised work with clients is required.
Repeatable to: 15 credits.
Credit Only Granted for: PSYC629 or PSYC632.
Formerly: PSYC632.

PSYC630 Behavioral and Cognitive Behavioral Intervention for Adults (3 Credits)
Introduces students to the process of therapy with particular focus on behavioral focus on behavioral and cognitive behavioral internentions. Syllabus focuses on theory, research, client diversity, ehtics, and practical aspects of conducting therapy.
Prerequisite: PSYC680.
Restriction: Permission of instructor.
Credit Only Granted for: PSYC630 or PSYC728.
Formerly: PSYC728.

PSYC632 Behavioral and Cognitive Behavioral Intervention for Children and Adolescents (3 Credits)
Introduces students to the process of therapy with particular focus on behavioral and cognitive behavioral interventions in children and adolescents. Syllabus focuses on theory, research, client diversity, ethics and practical aspects of conducting therapy.
Restriction: Permission of instructor; and must be in one of the following programs (Psychology (Master's); Psychology (Doctoral)).
Formerly: PSYC789A.

PSYC638 Externship in Professional Psychology (1-3 Credits)
Approved appointment as an extern in a mental health setting.
Repeatable to: 6 credits if content differs.

PSYC639 Internship in Professional Psychology (1 Credit)
This seminar combines involvement with a program approved appointment as an intern in a mental setting with a supervisory review of the training experience.
Repeatable to: 6 credits if content differs.

PSYC642 Biological Considerations in Clinical Psychology (3 Credits)
Behaviors are based partially in the bilogy of the human organism. This course begins with an examination of the nature-nurture issue on psychology, particularly as it applies to clinical psycology. Genetic underpin nings of behavior their neuroanatomical neurochemical expressions will be explored. This course will also examine psychopsychiological meas ures and the role of psychoparmacology and other biological interventions in treatment.

PSYC643 Ethics, Diversity, and Professional Issues in Clinical Psychology (3 Credits)
An overview of the ethical and professional issues involved in psychological research, instruction, and practice, with special attention to advocacy and ethical decision making regarding a variety of primary, secondary, and tertiary clinical/community interventions.
Restriction: Permission of instructor; and must be in one of the following programs (Psychology (Master's); Psychology (Doctoral)).

PSYC644 Basic Foundation of Clinical Interventions (3 Credits)
General introduction to behavior theory and the basic behavioral principles that underlie behavior therapy. Provides an introduction to the philosophical, theoretical and empirical contributions of basic behavior analysis as they relate to behavior therapy, including examples of how behavior therapy is disconnected from its roots.
Restriction: Permission of instructor; and must be in one of the following programs (Psychology (Master's); Psychology (Doctoral)).

PSYC650 Culture and Diversity in Mental Health (3 Credits)
Review literature regarding the role of culture and diversity in mental health and how culture and diversity are integrated into research and are related to mental health and mental health service utilization. Examine principles and concepts of multicultural and cross-cultural psychology to acquire an increased understanding of diverse underrepresented groups and topics to consider when involved with research and/or clinical work with individuals having diverse backgrounds (e.g., cultures, ethnicities, genders, sexual orientations, and socioeconomic status).
Restriction: Must be enrolled in the Clinical Psychological Science MPS program.

PSYC651 Writing and Critical Thinking (3 Credits)
A capstone experience to integrate knowledge learned throughout the program and improve critical thinking and research writing skills. This will be done through the production of a major research paper in an area relevant to the current or future career goals of the student and by emphasizing critical thinking skills.
Restriction: Must be enrolled in and have successfully completed all courses in the first 4 terms of the Clinical Psychological Science MPS program.

PSYC652 Analytical Thinking: Statistical Methods at Work (3 Credits)
Personal and organizational growth begins with asking and answering great questions. Correspondingly, this course begins with demonstrations of how to translate business questions into research questions. Statistical methods used to answer business questions are taught first conceptually, then computationally using statistical software. This course emphasizes interpreting results, the regression model, and other issues salient to business research, such as handling large datasets. Students will be provided with a simulated dataset that they will use in learning how to frame and answer business questions using the techniques covered in this course. At the conclusion of this course, students will be required to provide an executive-level presentation on the business question, their findings, and resulting implications.
Additional Information: Students will be taught how to conduct analyses in R, SPSS, SAS, Stata, and excel; students are encouraged to practice analyses on at least two of these programs.

PSYC653 The Business of Evaluation: Research Methods at Work (3 Credits)
Students will learn about the strengths and weaknesses of commonly employed research methods in business settings, including: longitudinal research, survey and interview (including focus groups) design, and sampling and weighting. Students will design and launch a research study that will answer a pressing business question.
Prerequisite: PSYC652.
Additional Information: Course builds from work completed in PSYC 652. Students are also expected to commit to a two-term long project. Students will work with a non-profit organization or local business to ask and answer a business question for the organization. Students will conclude this project in PSYC 654.

PSYC654 Advanced Analytical Thinking: Statistical Methods at Work II (3 Credits)
Students will delve deeply into issues of interpreting and questioning analytic results. Students will learn how to creatively present empirical results in ways that grab the attention of, and are clear to, a variety of stakeholders. Students will present group projects in two presentations, one to the rest of the class (technical audience) and one to an expert panel of practitioners. Finally, this course will introduce students conceptually to a number of advanced statistical methods, such as meta-analysis and structural equation modeling.
Prerequisite: PSYC652 and PSYC653.
Restriction: Must be in the Master of Professional Studies in Industrial/Organizational Psychology Program.

PSYC655 Talent Development (3 Credits)
In this course, students will learn how to design and implement effective employee training programs as well as how to encourage informal learning in organizations. This course will review current theories in adult learning (e.g., ADDIE model, action learning, peer feedback/coaching), several popular assessment tools (e.g., MBTI), and best practices for evaluating training programs. Issues relevant to leadership identification and development, including succession planning, will also be covered. As part of this course, students will work in teams to design and deliver a brief training module and practice giving and receiving feedback. Additionally, students will complete, and facilitate a debriefing on, a 360-degree feedback assessment.
Restriction: Must be in the Master of Professional Studies in Industrial/Organizational Psychology Program.

PSYC656 Business Fundamentals and Legal Issues facing Organizations (3 Credits)
This course provides an overview of the fundamentals of business, including both issues of finance and legal issues faced by organizations. Topics will include finance, accounting, and marketing. Students will learn core business concepts, about how each major business function enables organizations to run, and how to talk to and understand the leaders of organization. Additionally, this course will provide an overview of common legal challenges organizations face. In addition to introducing students to employment law, this course will review professional ethics standards for IO psychology. This course will use case study methodology to hone students' understanding of the ethical and legal issues faced in day-to-day organizational life.
Restriction: Must be in the Master of Professional Studies in Industrial/Organizational Psychology Program.

PSYC657 Managing Strategic Organizational Change (3 Credits)
In this course, students will learn to think about organizations as systems and will explore catalysts of organizational change. Issues of strategy, market pressure, competition, workforce planning, and stakeholder buy-in will be discussed. Finally, students will learn about methods for planning, leveraging, and managing organizational change. Case study methodology will be used to deepen learning on the challenges faced during organizational change and how to guide organizations through change, planned or not.
Restriction: Must be in the Master of Professional Studies in Industrial/Organizational Psychology Program.

PSYC660 Performance Management, Compensation, and Benefits (3 Credits)
This course draws together content on organizational behavior, selection, assessment, development, employee relations, and compensation, among other topics. Students in this course will learn about how to align organizational reward systems, including selection, development, performance appraisal, feedback, and compensation systems. This course will pull from current organizational research and theory on issues ranging from work motivation, employee retention, and feedback processes to issues of organizational strategy and culture.
Restriction: Must be in the Master of Professional Studies in Industrial/Organizational Psychology Program.

PSYC661 Practicum in IO Psychology (3 Credits)
In this practicum, students will work on IO-related tasks in an organization and will have the opportunity to apply what they have learned in class to real-world problems. Students will write a reflection paper reviewing what skills they have applied - and developed - while completing this practicum.
Prerequisite: PSYC603, PSYC652, PSYC653, and PSYC654.
Restriction: Must be in the Master of Professional Studies in Industrial/Organizational Psychology Program.

PSYC669 Professional Issues in Counseling Psychology (1 Credit)
Introduction to counseling psychology, including history and development of the field, and current professional and scientific issues. Exploration of career, research, and professional development opportunities.
Prerequisite: Must be in the Counseling Psychology program.
Cross-listed with: EDCP669.
Repeatable to: 3 credits if content differs.
Formerly: EDCP695.

PSYC678 Seminar in Psycholinguistics (3 Credits)
Contemporary psycholinguistic theories of language acquisition and use. Phonological, semantic and syntactic aspects of language.
Prerequisite: PSYC671.
Repeatable to: 6 credits.

PSYC679 Seminar in Cognitive Development (3 Credits)
Advanced coverage of research methodology and research issues in various areas of cognitive development such as categorization, spatial understanding, language acquisition, and memory. Emphasis on interrelationships among developmental changes across the life-span. Utility of a developmental perspective in analyzing the components of cognition.
Prerequisite: PSYC611 or PSYC671.
Repeatable to: 6 credits.

PSYC682 Counseling Psychology Didactic Practicum in Group Interventions (3 Credits)
In depth examination of theories and techniques of group interventions; supervised experience in group counseling.
Prerequisite: For Counseling Psychology majors only.
Cross-listed with: EDCP682.
Formerly: EDCP718.

PSYC683 Counseling Psychology Didactic-Practicum in Couples and Family Interventions (3 Credits)
In depth examination of theories and techniques of couples and family counseling, and supervised experience in couples/family counseling.
Restriction: Permission of instructor.
Credit Only Granted for: PSYC683 or PSYC729.
Formerly: PSYC729.

PSYC685 Counseling Psychology Didactic Practicum in Counseling Supervision (3 Credits)
In depth examinatin of theories and techniques of counseling supervision, supervised experience in the process of supervising counselors.
Cross-listed with: EDCP685.
Restriction: Must be in the Counseling Psychology program.
Formerly: EDCP745.

PSYC686 Didactic Practicum in Career Counseling (3 Credits)
In depth examination of approaches to issues in career interventions; supervised experience in career counseling and assessment.
Credit Only Granted for: PSYC681 or PSYC686.
Formerly: PSYC681.

PSYC688 Ethicial and Legal Issues in Counseling Psychology (1 Credit)
Exploration of ethical standards and legal issues in the profession of counseling psychology.
Restriction: Must be in the Counseling Psychology program.
Repeatable to: 3 credits if content differs.

PSYC689 Seminar in Counseling Psychology (3 Credits)
Special topics in counseling psychology. Examples of topics include multicultural counseling, the counseling relationship, counseling and victimology, psychology treatment and health.
Prerequisite: For Counseling Psychology majors only.
Cross-listed with: EDCP689.
Repeatable to: 12 credits if content differs.
Formerly: EDCP789.

PSYC690 Research in Counseling Psychology I (3 Credits)
Critical analysis of strategies, methodological, conceptual, and content trends.
Prerequisite: For Counseling Psychology majors only.
Cross-listed with: EDCP690.
Formerly: EDCP778.

PSYC691 Research in Counseling Psychology II (3 Credits)
Critical analysis of trends and issues in counseling psychology science.
Restriction: Permission of instructor.
Credit Only Granted for: PSYC691 or PSYC718.
Formerly: PSYC718.

PSYC692 Assessment in Counseling Psychology I (3 Credits)
Broad introduction to the construction of psychological tests and measures, and experience in test interpretation, with consideration of historical, legal, ethical, and cultural issues surrounding the assessment process.
Prerequisite: PSYC680.
Credit Only Granted for: PSYC692 or PSYC721.
Formerly: PSYC721.

PSYC693 Assessment in Counseling Psychology II (3 Credits)
Supervised experience in administration, scoring, and interpreting major psychodiagnostic instruments used by counseling psychologists, as well as writing integrative assessment reports. Emphasis on hypothesis testing approach to assessment and on the counseling interview as an assessment tool.
Prerequisite: PSYC692.
Credit Only Granted for: PSYC693 or PSYC722.
Formerly: PSYC722.

PSYC695 Ethical and Professional Issues in Counseling Psychology (3 Credits)
Exploration of ethical and professional issues in Counseling Psychology.
Restriction: Must be in the Counseling Psychology program. Also offered as: EDCP695.
Credit Only Granted for: EDCP669, EDCP688, EDCP695, PSYC688, or PSYC695.
Formerly: EDCP669 and EDCP688.

PSYC698 Advanced Didactic Practicum in Counseling Psychology (3 Credits)
In depth examination of approaches to or theories abouth intervention, and supervised experience in the application of those approaches or theories. Each practicum focuses on a particular approach, e.g., psychodynamic, cognitive-behavioral, cross-cultural.
Prerequisite: For Counseling Psychology majors only.
Cross-listed with: EDCP698.
Repeatable to: 12 credits if content differs.
Formerly: EDCP776.

PSYC699 Diversity and Multiculturalism in Counseling Psychology (1 Credit)
Exploration of knowledge, attitudes, and skills for providing counseling psychological services to culturally diverse populations.
Restriction: Must be in the Counseling Psychology program.
Repeatable to: 3 credits if content differs.
Formerly: EDCP696.

PSYC700 Theories and Strategies of Counseling Psychology (3 Credits)
Introduction to the professional field, examination of pertinent scientific and philosophical backgrounds, and survey of the major theories, principles, and training models in counseling. Correlated laboratory analogue experiences in dydactic and group interrelationships.
Prerequisite: For Counseling Psychology majors only.
Cross-listed with: EDCP700.
Formerly: EDCP789J.

PSYC707 Theory of Decision and Choice (3 Credits)
A study of algebraic and probabilistic models for decision and choice behavior, and related experimental procedures. Topics include: measurement of preference, subjective utility models for certain and uncertain outcomes, normative strategies, decision making styles, and group decision making.
Prerequisite: PSYC602.
Restriction: Permission of instructor.

PSYC708 Seminar in Psychometric Theory (3 Credits)
Study of the current practices, trends, or recent developments in psychometric theory.
Prerequisite: PSYC602; or permission of instructor.
Repeatable to: 9 credits if content differs.

PSYC709 Seminar in Mathematical Models (3 Credits)
Special topics in mathematical psychology. A discussion of quantitative representations of psychological processes in one or more substantive areas of psychology.
Prerequisite: PSYC602; or permission of instructor.
Repeatable to: 9 credits if content differs.

PSYC725 Teams at Work (3 Credits)
Theory and research regarding the formation, management, and functioning of teams in the workplace; including team composition, team rewards, team-task and team-organization relationships and fit, team productivity, and the selection for and training of teams. International use of teams at work.
Prerequisite: PSYC602; or permission of instructor.
Credit Only Granted for: PSYC725 or PSYC747.
Formerly: PSYC747.

PSYC732 Selection and Classification Issues in Organizations (3 Credits)
Consideration of societal, organizational and individual demands for appropriate use of individual differences in (primarily) initial placement of employees. Recruitment, and selection issues, the role of governmental regulations, and the role of individual factors in individual behavior are considered. Extensive coverage given to fundamental psycho-metric problems and the development of individual and organizational criteria of effectiveness.
Prerequisite: PSYC603; and (PSYC602; or students who have taken courses with comparable content may contact the department). Or permission of instructor.

PSYC737 Research Methods for Social and Organizational Psychology (3 Credits)
Conducting and evaluating research are among the most important activities undertaken in social and organizational psychology. Effectively accomplishing these tasks requires understanding fundamental principles and practices relevant to theory development (constructing and improving explanatory accounts for phenomena), research design (techniques and methods used to collect observations/data), and measurement (processes and techniques by which observations are assessed, quantified, and documented). This course aims to develop the requisite knowledge and critical thinking skills necessary to make informed decisions when performing and interpreting research in social and organizational psychology. Significant emphasis is placed on developing student thesis research and proposals.
Prerequisite: PSYC603 or PSYC604; or permission of instructor.

PSYC738 Seminar in Industrial/Organizational Psychology (3 Credits)
An occasional advanced seminar covering specialized topics.
Prerequisite: PSYC603; or permission of instructor.
Repeatable to: 99 credits if content differs.

PSYC739 The Psychology of Workplace Change and Innovation (3 Credits)
Organizational change and innovation research and theory, current impetuses for organizational change (e.g., economic, demographic, and technological trends) and specific workplace innovations (e.g., employee ownership, QWL, CAD/CAM, etc.)
Prerequisite: PSYC603; or permission of instructor.

PSYC743 Social Cognition (3 Credits)
Explores research and theorizing related to the cognitive processes at play while people navigate the social world, including the attribution of personal characteristics, errors and biases in social judgment, social information processing, person memory, motivated social cognition and cognition in groups.

PSYC748 Seminar in Social Psychology (3 Credits)
A seminar on selected topics in social psychology.
Repeatable to: 15 credits if content differs.

PSYC749 Current Research in Social Psychology (1-3 Credits)
Repeatable to: 12 credits if content differs.

PSYC758 Seminar in the Neural Bases of Sensory Processes (3 Credits)
Selected topics in vision and the other senses.
Prerequisite: PSYC605; or permission of instructor.
Repeatable to: 9 credits if content differs.

PSYC759 Seminar in Neural Bases of Perceptual Processes (3 Credits)
Selected topics in perceptual phenomena and their physiological bases.
Prerequisite: PSYC605; or permission of instructor.
Repeatable to: 9 credits if content differs.

PSYC768 Conditioning and Learning (3 Credits)
Alternate years. The literature on the experimental analysis of behavior, with examination of basic experiments and contemporary theories related to them.
Prerequisite: PSYC622.

PSYC778 Seminar in Learning and Memory (3 Credits)
An advanced topical seminar covering the areas of human learning and memory. Acquisition processes, storage and retrieval processes, and attention and information processing.
Prerequisite: PSYC671.
Repeatable to: 6 credits if content differs.

PSYC779 Seminar in Human Performance Theory (3 Credits)
An examination of human-machine interactions with emphasis on theories and research which focus on human performance capabilities and skills. Topics selected from information processing, communications, human computer interaction, decision making, environmental constraints and automation.
Restriction: Permission of instructor.
Repeatable to: 6 credits if content differs.
Formerly: PSYC735.

PSYC788 Special Research Problems (1-4 Credits)
Supervised research on problems selected from the areas of experimental, industrial, social, quantitative, or mental health psychology.

PSYC789 Special Research Problems (1-4 Credits)

PSYC798 Graduate Seminar (1-4 Credits)
Repeatable to: 12 credits if content differs.

PSYC799 Master's Thesis Research (1-6 Credits)

PSYC818 Research Issues in Personality Or Development (3 Credits)
Experimental design and methodology and statistical treatment of data appropriate to personality or developmental research; critical analysis of major current areas of research including methodologies, findings and implications. The course will focus on either personality research or developmental research in a given semester.
Prerequisite: PSYC602 and PSYC601. And PSYC611 or PSYC612; or students who have taken courses with comparable content may contact the department.
Repeatable to: 9 credits.

PSYC819 Seminar in Personality and Development (3 Credits)
An advanced seminar covering specialized topics.
Repeatable to: 9 credits.

PSYC859 Special Topics in Perception (3 Credits)
Intensive study of selected topics in perception.
Prerequisite: PSYC605; or permission of instructor.
Repeatable to: 6 credits.

PSYC878 Current Research in Language and Cognition (3 Credits)
Seminar will cover current research and methodological issues in language and cognition. Specialized topics include: computer models of cognitive behavior; cross-cultural studies in language and thought; mathematical and analytical techniques for assessing structures; and others.
Prerequisite: PSYC671.
Repeatable to: 6 credits.

PSYC888 Research Methods in Psychology (1-3 Credits)

PSYC889 Research Methods in Psychology (1-3 Credits)

PSYC898 Pre-Candidacy Research (1-8 Credits)

PSYC899 Doctoral Dissertation Research (1-8 Credits)

PUAF - Public Policy

QMMS - Quantitative Methodology: Measurement and Statistics

QMMS410 Classroom Assessment (3 Credits)
Developing and using classroom assessments, including tests, performance assessments, rating scales, portfolios, observations and oral interactions; basic psychometric statistics; standard setting; grading; communicating assessment information; testing ethics; locating and evaluating measures; program evaluation and classroom research; assessments used for educational policy decisions.
Restriction: Junior standing or higher.
Formerly: EDMS410.

QMMS451 Applied Educational Statistics (3 Credits)
Introduction to statistical reasoning; location and dispersion measures; data analysis; regression and correlation; formation of hypotheses tests;
Restriction: Sophomore standing or higher.
Credit Only Granted for: EDMS451 or QMMS451.
Formerly: EDMS451.

QMMS489 Field Experiences in Measurement and Statistics (1-4 Credits)
Planned field experience in education-related activities. Credit not to be granted for experiences accrued prior to registration.
Restriction: Permission of EDUC-Human Development and Quantitative Methodology department.
Repeatable to: 4 credits.

QMMS498 Special Problems in Measurement and Statistics (1-3 Credits)
Available only to education majors who have formal plans for individual study of approved problems.
Restriction: Permission of EDUC-Human Development and Quantitative Methodology department.
Repeatable to: 6 credits.

QMMS610 Classroom Assessment and Evaluation (3 Credits)
Develop the understandings and skills needed to validly, reliably, and accurately assess student learning and to provide focused leadership in the area of classroom assessment.
Credit Only Granted for: EDMS610 or QMMS610.
Formerly: EDMS610.

QMMS622 Theory and Practice of Standardized Testing (3 Credits)
Principles of interpretation and evaluation of aptitude, achievement, and personal-social instruments; theory of reliability and validity; prediction and classification; norm- and criterion-referenced testing concepts.
Prerequisite: QMMS451, QMMS645, EDMS451, or EDMS645 .

QMMS623 Applied Measurement: Issues and Practices (3 Credits)
Test theory and its application at an intermediate level. Item analysis, reliability and validity evidence, elements of generalizability theory, factor analysis, and item response theory, measurement invariance, and test equating.
Prerequisite: QMMS410 and QMMS645.
Credit Only Granted for: EDMS623 or QMMS623.
Formerly: EDMS623.

QMMS626 Instrumentation (3 Credits)
Theory, development, and applications of various affective, cognitive, or behavioral measurement instruments and procedures, including questionnaire and test items, observational protocols, and cutting-edge innovative game and scenario-based assessments.
Prerequisite: QMMS623.
Credit Only Granted for: EDMS626 or QMMS626.
Formerly: EDMS626.

QMMS645 Foundations of Quantitative Research Methods (3 Credits)
Research design and statistical applications in educational research: data representation; descriptive statistics; estimation and hypothesis testing. Application of statistical computer packages is emphasized.
Credit Only Granted for: EDMS645 or QMMS645.
Formerly: EDMS645.

QMMS646 Regression Analysis for the Education Sciences (3 Credits)
Theory and application of multiple linear regression. Estimation and interpretation of regression coefficients, models with discrete predictors (e.g., analysis of covariance), interaction and polynomial terms, model evaluation and comparison, and detection of outliers and influential cases.
Prerequisite: QMMS645 or EDMS645; or an equivalent introductory statistics course.
Credit Only Granted for: QMMS646 or EDMS646.
Formerly: EDMS646.

QMMS647 Causal Inference and Evaluation Methods (3 Credits)
Research designs and statistical methods for impact evaluation. Theory and application of randomized experiments, propensity score matching, difference-in-differences, interrupted time-series analysis, instrumental variables, and regression discontinuity designs
Prerequisite: Must have completed or be concurrently enrolled in QMMS651.
Credit Only Granted for: EDMS647 or QMMS647.
Formerly: EDMS647.

QMMS651 Regression Analysis for the Education Sciences II (3 Credits)
A follow-up course of Regression Analysis for the Education Sciences I, focusing on various theoretical extensions of multiple linear regression and their applications. Topics include the weighted least square and maximum likelihood estimation, nonlinear regression, nonparametric regression, generalized linear models for discrete data (e.g., logistic and Poisson regression), and bootstrapping.
Prerequisite: QMMS646 or EDMS646; or students who have taken courses with comparable content may contact the department.
Credit Only Granted for: EDMS651 or QMMS651.
Formerly: EDMS651.

QMMS655 Introduction to Multilevel Modeling (3 Credits)
Introduction to multilevel/mixed effects/random effects models and methodology as strategies for modeling nested data in educational contexts.
Prerequisite: QMMS651; or students who have taken courses with comparable content may contact the department.
Credit Only Granted for: EDMS655 or QMMS655.
Formerly: EDMS655.

QMMS657 Exploratory Latent and Composite Variable Methods (3 Credits)
Development of models for exploratory factor analysis and their practical applications. Additional topics will draw from latent class analysis, cluster analysis, mixture models, classification and regression trees, and social network models.
Prerequisite: QMMS651.
Credit Only Granted for: EDMS657 or QMMS657.
Formerly: EDMS657.

QMMS665 Data Analysis and Statistical Consulting (3 Credits)
Advanced data analysis procedures applied to real-world clients' problems arising in a wide variety of substantive research settings within and beyond education.
Prerequisite: QMMS651; or students who have taken courses with comparable content may contact the department.
Credit Only Granted for: EDMS665 or QMMS665.
Formerly: EDMS665.

QMMS722 Structural Modeling (3 Credits)
Statistical theory and methods of estimation used in structural equation modeling; computer program applications; measured variable path models; confirmatory factor analysis; latent variable path models; multisample models; mean structure models; latent growth models; power in SEM.
Prerequisite: QMMS657.
Credit Only Granted for: EDMS722 or QMMS722.
Formerly: EDMS722.

QMMS724 Item Response Theory (3 Credits)
Theoretical formulations of measurement from a latent trait theory perspective.
Prerequisite: QMMS623 and QMMS651.
Credit Only Granted for: EDMS724 or QMMS724.
Formerly: EDMS724.

QMMS738 Seminar in Special Problems in Measurement (1-3 Credits)
An opportunity for students with special interests to focus in depth on contemporary topics in measurement. Topics to be announced, but will typically be related to applied and theoretical measurement.
Restriction: Permission of EDUC-Human Development and Quantitative Methodology department.
Repeatable to: 12 credits if content differs.
Formerly: EDMS738.

QMMS747 Design of Program Evaluations (3 Credits)
Analysis of measurement and design problems in program evaluations.
Prerequisite: QMMS626, QMMS651, and QMMS647.

QMMS769 Special Topics in Applied Statistics in Education (1-4 Credits)
Designed primarily for students majoring or minoring in Quantitative Methodology: Measurement and Statistics
Restriction: Permission of EDUC-Human Development and Quantitative Methodology department.
Repeatable to: 24 credits if content differs.
Formerly: EDMS769.

QMMS771 Multivariate Data Analysis (3 Credits)
Principal components, canonical correlation, discriminant functions, multivariate analysis of variance/covariance and other multivariate techniques.
Prerequisite: QMMS651.

QMMS779 Seminar in Applied Statistics (1-3 Credits)
Enrollment restricted to students with a major or minor in Quantitative Methodology: Measurement and Statistics. Seminar topics will be chosen by individual student interest.
Restriction: Permission of EDUC-Human Development and Quantitative Methodology department. And must be in Measurement, Statistics and Evaluation (Master's) program; or must be in Measurement, Statistics and Evaluation (Doctoral) program.
Repeatable to: 24 credits if content differs.
Formerly: EDMS779.

QMMS787 Bayesian Inference and Analysis (3 Credits)
Models and model fitting methods commonly used in Bayesian Inference, such as Markov Chain Monte Carlo methods (e.g., Gibbs, Metropolis Sampling), with applications within and beyond the social and behavioral sciences. Analytical and philosophical differences between Frequentist and Bayesian statistics will also be highlighted.
Prerequisite: QMMS779 or permission of the instructor.
Credit Only Granted for: EDMS787 or QMMS787.
Formerly: EDMS787.

QMMS798 Special Problems in Education (1-6 Credits)
Master's, QMMS majors, or doctoral candidates who desire to pursue special research problems under the direction of their advisors may register for credit under this number.
Restriction: Must be in Measurement, Statistics and Evaluation (Master's) program; or must be in Measurement, Statistics and Evaluation (Doctoral) program.
Repeatable to: 24 credits if content differs.
Formerly: EDMS798.

QMMS799 Master's Thesis Research (1-6 Credits)
Registration required to the extent of 6 credits.
Restriction: Must be in a major within the EDUC-Human Development and Quantitative Methodology department.
Repeatable to: 24 credits.
Formerly: EDMS799.

QMMS879 Doctoral Seminar (1-3 Credits)
Seminar that supports analysis of doctoral projects and theses, and of other on-going research projects.
Restriction: Permission of EDUC-Human Development and Quantitative Methodology department.
Repeatable to: 24 credits.

QMMS889 Internship in Measurement and Statistics (3-12 Credits)
Provides internship experiences at a professional level of competence in a particular role with appropriate supervision. Credit not to be granted for experience accrued prior to registration. Open only to students advanced to candidacy for doctoral degree.
Prerequisite: Open only to students advanced to candidacy for doctoral degree.
Restriction: Permission of EDUC-Human Development and Quantitative Methodology department.
Repeatable to: 24 credits.
Formerly: EDMS889.

QMMS898 Pre-Candidacy Research (1-8 Credits)
Pre-Candidacy Research for Doctoral Students
Repeatable to: 24 credits.
Formerly: EDMS898.

QMMS899 Doctoral Dissertation Research (1-8 Credits)
Registration required to the extent of 12 credits.
Repeatable to: 24 credits.
Formerly: EDMS899.

RDEV - Real Estate Development

RDEV410 Legal Foundations of Real Estate (3 Credits)
Provides students with the chance to explore various legal topics related to real estate, including government regulation, rights of property owners, financing real estate purchases, protections for certain classes of people, elements of a real estate contract, title, insurance, taxation, rights of landlords and tenants, premises liability, urban planning, land use regulation, and environmental issues.
Prerequisite: RDEV250 and RDEV350.
Restriction: Must be in the Real Estate and the Built Environment major; and permission of ARCH-Real Estate Development; and must have earned a minimum 60 credits.

RDEV415 Principles, Process and Politics of Planning for Real Estate Development (3 Credits)
Designed to introduce and familiarize students with planning and zoning and the associated processes and requirements that impact the real property development process and products. It will look at the roles the community and politics play in shaping the built environment and the development process.
Prerequisite: RDEV250 and RDEV350.
Restriction: Must be in the Real Estate and Built Environment major; and permission of ARCH-Real Estate Development; and must have earned a minimum 60 credits.

RDEV440 Principles of Urban Design for Real Estate Professionals (3 Credits)
Introduces students to the design issues associated with development of the basic real property asset classes (office, retail, and residential) and the context driven forces that shape these different development types. Also introduces non-design students to the principles of visual literacy and the capacity of different property to support development in the effort to enhance a community.
Prerequisite: RDEV250 and RDEV350.
Restriction: Must be in Real Estate and Built Environment Major; and permission of ARCH-Real Estate Development.

RDEV445 Essentials of Architectural Design and Construction Management for Real Estate Professionals (3 Credits)
Essential terminology, process and substantive knowledge needed by development professionals to effectively move a project through the design and construction process; includes environmental and ethical considerations throughout the process.
Restriction: Must be in the Real Estate and the Built Environment major; and permission of ARCH-Real Estate Development.

RDEV450 Foundations of Real Estate Finance and Investment (3 Credits)
Real Estate Finance and Investment addresses how real estate value is established, the fundamental foundations of the time value of money, as well as more real estate specific applications of return on investment, net operating income, the components of a real estate sources and uses statement, sources of real estate equity and debt financing, commonly used debt ratios and equity returns in real estate, as well as concepts of sensitivity analysis and exit strategies.
Prerequisite: Must have completed RDEV270 or an approved accounting course with a grade of C- or better; and minimum grade of C- in RDEV350.
Restriction: Must be enrolled in RDEV Minor; and permission of ARCH-School of Architecture, Planning, & Preservation.

RDEV470 Real Estate Development Case Studies (3 Credits)
Real Estate Development Case Studies takes the principles learned in RDEV 250, 350 and 450 and takes an in depth look at a selection of local, national and international case studies in residential, commercial office, retail and hospital and critically analyzes the success and failure, short term and long term of the projects.
Prerequisite: RDEV450.
Restriction: Must be in the Real Estate and the Built Environment major or Real Estate Development minor; and permission of ARCH-Real Estate Development.

RDEV473 Real Estate Case Study Competition (3 Credits)
The Colvin Institute of Real Estate Development hosts a case study competition. The Colvin Case Study Challenge is a national intercollegiate real estate case study competition for full or part-time students enrolled in a college or a university real estate program (undergraduate or graduate or a university sanctioned real estate club/organization). The Challenge is to document a recent innovative real estate project within the team's metropolitan region. Unlike many other case competitions, this is a post-development report and documentation of a recently completed project (or project phase). The Challenge is designed to hone professional skills and reveal the knowledge base and understanding of markets, project valuation, finance, urban design and sustainability, entitlement processes and operational issues. This course prepares students to participate in the competition.
Prerequisite: RDEV250, RDEV350, and RDEV450.
Restriction: Must be in the Real Estate and the Built Environment major; and permission of ARCH-Real Estate Development.

RDEV478 Special Topics in Real Property Development (1-3 Credits)
RDEV 478 will address one or more current topics in real property with a focus in one or more of the areas of real estate development from planning and entitlements, to design and construction, to market analysis and valuation, to finance and investment, to operations and property management, or social and economic impacts.
Recommended: RDEV250, RDEV350, and RDEV450.
Restriction: Permission of ARCH-School of Architecture, Planning, & Preservation.
Repeatable to: 6 credits if content differs.

RDEV600 Principles and Practice of Real Property Development (3 Credits)
An introduction to basic principles of real estate development: How real estate and communities get built and how value is created. The emphasis is on entrepreneurship and an experiential learning approach to the entrepreneurial real estate development process, principles, and practice.
Restriction: Permission of ARCH-Real Estate Development.
Credit Only Granted for: RDEV688T or RDEV600.
Formerly: RDEV688T.

RDEV603 Introduction to Real Property Finance (3 Credits)
Introduction to Real Property Finance addresses how real estate value is established, the fundamental foundations of the time value of money, as well as more real estate specific applications of return on investment, net operating income, the components of a real estate sources and uses statement, sources of real estate equity and debt financing, commonly used debt ratios and equity returns in real estate, as well as concepts of sensitivity analysis and exit strategies.
Restriction: Permission of the Department.
Credit Only Granted for: RDEV688Z, RDEV689V, or RDEV603.
Formerly: RDEV688Z and RDEV689V.

RDEV605 Tax and Accounting for Real Property Developers (3 Credits)
This course is designed to familiarize students with taxation and accounting as it pertains to real estate development.
Restriction: Permission of ARCH-Real Estate Development.
Credit Only Granted for: RDEV688K or RDEV605.
Formerly: RDEV688K.

RDEV610 Real Property Development Law and Ethics (3 Credits)
Presents foundational knowledge about real property, contracts, administrative and constitutional law, and ethical principals and reasoning skills.
Restriction: Permission of ARCH-Real Estate Development.
Credit Only Granted for: RDEV688A or RDEV610.
Formerly: RDEV688A.

RDEV615 Principles, Process and Politics of Planning for Real Property Development (3 Credits)
Designed to introduce and familiarize students with planning and zoning and the associated processes and requirements that impact the real property development process and products. It will look at the roles the community and politics play in shaping the built environment and the development process.
Restriction: Permission of ARCH-Real Estate Development.
Credit Only Granted for: RDEV688G or RDEV615.
Formerly: RDEV688G.

RDEV620 Market Analysis for Real Property Development (3 Credits)
Designed to introduce and familiarize students with completing market analysis for real property projects. Includes a broad range of land uses including for-rent and for-sale residential, retail, office, and hospitality. Covers all aspects of completing a market analysis from the site visit to recommendations, and all the steps in-between. Examines how various real estate practitioners, such as developers, builders, investors, landowners, and public officials, utilize market studies.
Restriction: Permission of ARCH-Real Estate Development.
Credit Only Granted for: RDEV689M or RDEV620.
Formerly: RDEV689M.

RDEV630 Real Property Finance and Investment (3 Credits)
This course is designed to introduce students who have experience in real estate finance or have taken an introductory course in real estate finance and investment to move to this intermediate course that addresses foundational concepts of commercial real estate finance and the measures used in analyzing and evaluating real estate projects. Quantitative analysis and financial modeling comprise the main focus.
Restriction: Permission of ARCH-Real Estate Development.
Credit Only Granted for: RDEV630, RDEV688B, or URSP664.
Formerly: RDEV688B.

RDEV635 Capital Markets and Real Estate Investments for Developers (3 Credits)
An advanced course in real estate finance focusing on capital markets and complex financing mechanism in the public and private markets for raising capital for development of public, private and public/private projects.
Prerequisite: RDEV630, URSP664, or RDEV688.
Restriction: Must be in Real Estate Development (Master's) program; or permission of ARCH-Real Estate Development.
Credit Only Granted for: RDEV635 or RDEV688F.
Formerly: RDEV688F.

RDEV640 Principles of Urban Design for Real Property Developers (3 Credits)
Introduces students to the design issues associated with development of the basic real property asset classes (office, retail, and residential) and the context driven forces that shape these different development types. Also introduces non-design students to the principles of visual literacy and the capacity of different property to support development in the effort to enhance a community.
Restriction: Permission of ARCH-Real Estate Development.
Credit Only Granted for: RDEV688J or RDEV640.
Formerly: RDEV688J.

RDEV650 Essentials of Design and Construction Management for Development Professionals (3 Credits)
Essential terminology, process and substantative knowledge needed by development professionals to effectively move a project through the design and construction process; includes environmental and ethical considerations throughout the process.
Restriction: Must be in Real Estate Development (Master's) program; or permission of ARCH-Real Estate Development.
Credit Only Granted for: RDEV650 or RDEV688C.
Formerly: RDEV688C.

RDEV660 Commercial Leasing for Real Property Developers (3 Credits)
Provides students with a hands-on look at commercial and real estate leases, lease provisions, and current market activity, a key factor in determining when and whether to proceed with developing a commercial property.
Restriction: Permission of ARCH-Real Estate Development.
Credit Only Granted for: RDEV688L or RDEV660.
Formerly: RDEV688L.

RDEV670 Negotiating Agreements & Resolving Conflicts when Developing Real Property (3 Credits)
Designed to develop students' negotiation and leadership skills for managing differences between individuals and groups while in the process of developing and operating real property. Includes a blend of skill-building exercises and theory discussions about the behavior of individuals to understand negotiation dynamics.
Restriction: Permission of ARCH-Real Estate Development.
Credit Only Granted for: RDEV688E or RDEV670.
Formerly: RDEV688E.

RDEV688 Selected Topics in Real Estate Development (3 Credits)
Selected topics in real estate development.
Prerequisite: Permission of ARCH-Real Estate Development.
Repeatable to: 8 credits if content differs.

RDEV689 Current Topics in Real Estate Development (1-3 Credits)
Explores a focused aspect in any of the five major phases of real estate development: planning, finance, law, design, construction, or management.

RDEV690 Capstone Project: Real Property Feasibility Study (3 Credits)
The capstone course is designed to provide students with an opportunity to apply acquired classroom knowledge to real world conditions. Each student in the class will work separately to create a development proposal and feasibility study for an assigned property. For students doing a feasibility study of a development the study will address at least market analysis, entitlement process, construction, and financing for the project.
Prerequisite: Completion of at least 7 RDEV courses.
Restriction: Permission of ARCH-Real Estate Development.
Credit Only Granted for: RDEV688I or RDEV690.
Formerly: RDEV688I.

RELS - Religious Studies

RELS408 Capstone Seminar for Religions of the Ancient Middle East (3 Credits)
A capstone seminar for majors in Religions of the Ancient Middle East, designed to provide the intellectual framework for a substantial, interdisciplinary research project. Course topics will be thematic and students will be encouraged to explore comparative or interdisciplinary approaches.
Repeatable to: 6 credits if content differs.

RELS419 Advanced Topics in Religious Studies (3 Credits)
The contemporary study of religion in which topics may address specific religious traditions, regional or historical developments, or methodological and theoretical issues.
Recommended: RELS216.
Repeatable to: 9 credits if content differs.

RELS427 The Epic of Gilgamesh (3 Credits)
One of the most famous tales from the ancient world, the Epic of Gilgamesh inspires readers with tales of friendship and loss, mortality, and the search for meaning. The story itself grew and changed over time and took on new meanings. Through study of the epic, its development over time, and the sources it drew from, this class will examine the meaning of the Gilgamesh epic and its impact on ancient Mesopotamian culture.
Prerequisite: JWST225, RELS225, HIST219I, or permission of the instructor.
Recommended: JWST262, ENGL262, or HEBR298B.
Cross-listed with: JWST427.
Credit Only Granted for: JWST419G, RELS419G, RELS427 or JWST427.
Formerly: JWST419G.

RELS429 Advanced Topics in Religious History (3 Credits)
Advanced study of religious history in a particular setting, with attention to particular themes, texts, events, or communities.
Recommended: RELS216 or RELS289.
Repeatable to: 9 credits if content differs.

RELS430 Dead Sea Scrolls (3 Credits)
A study of the Dead Sea Scrolls in their ancient and modern settings, and in terms of contemporary scholarly interpretations of their meaning. Interpretations of the historical significance of these documents, their connections to ancient Jewish sectarian movements, and their implications for our understanding of Judaism, Christianity, and the history of the Bible.
Prerequisite: Must have completed one JWST course or one RELS course; or permission of ARHU-Meyerhoff Program & Center for Jewish Studies. Cross-listed with JWST430.
Credit Only Granted for: JWST430 or RELS430.

RELS439 Advanced Topics in Religious Thought (3 Credits)
Advanced study of religious thought in a particular setting, with attention to particular themes, texts, events, or communities.
Recommended: RELS216 or RELS289.
Repeatable to: 9 credits if content differs.

RELS488 Honors Thesis Research in Religions of the Ancient Middle East (3 Credits)
Guided research on a thesis under the supervision of a faculty mentor.
Repeatable to: 6 credits if content differs.

RELS499 Independent Study in Religious Studies (1-3 Credits)
An advanced independent research project for qualified students, supervised by a faculty member, on a topic not ordinarily covered in available courses.
Prerequisite: Permission of ARHU-Meyerhoff Program & Center for Jewish Studies.
Repeatable to: 6 credits if content differs.

RELS600 Methods and Theories in the Study of Religion (3 Credits)
An exploration of scholarly approaches to the study of religion. The modern history of the secular study of religion, social dynamics, textual formations, and ritual practices.Jointly offered with RELS400.
Credit Only Granted for: RELS400, RELS419 T, RELS600, or RELS619T.
Formerly: RELS619T.

RELS619 Directed Readings in Religous Studies (3 Credits)
Individual Instruction course.
Repeatable to: 6 credits if content differs.

RUSS - Russian

RUSS401 Advanced Russian Composition (3 Credits)
Approaches to argumentation, organization of information, contextualized grammar, appropriateness of lexical choice, genre, and register.
Prerequisite: RUSS302; or students who have taken courses with comparable content may contact the department.

RUSS402 Practicum in Written Russian (3 Credits)
Designed to improve comprehension of functional varieties of written Russian and develop ability to present in written form concise syntheses of source texts.
Prerequisite: RUSS401; or students who have taken courses with comparable content may contact the department.

RUSS403 Russian Conversation: Advanced Skills (3 Credits)
Advanced spoken production of high-level, abstract language.
Prerequisite: Must have completed or be concurrently enrolled in RUSS301, or students who have taken courses with comparable content may contact the department.

RUSS404 Practicum in Spoken Russian (3 Credits)
To improve comprehension of rapidly spoken Russian of various functional styles and to develop ability to synthesize orally the content of spoken material.
Prerequisite: Must have completed or be concurrently enrolled in RUSS301, or students who have taken courses with comparable content may contact the department.

RUSS405 Russian-English Translation I (3 Credits)
Introduction to the principles of translation of a particular genre, and is typically diplomatic, business, or literary.
Prerequisite: Must have completed or be concurrently enrolled in RUSS302.

RUSS409 Selected Topics in Russian Language Study (3 Credits)
Presentation of a topic in Russian language study.
Restriction: Permission of ARHU-School of Languages, Literatures, and Cultures department.
Repeatable to: 6 credits if content differs.

RUSS411 Linguistic Analysis of Russian I (3 Credits)
Elucidation of theoretical concepts of modern linguistics through the analysis of problematic concepts in the Russian linguistic system. Phonology and the syntax of the simple sentence.
Prerequisite: Must have completed or be concurrently enrolled in RUSS301.

RUSS439 Selected Topics in Russian Literature (3 Credits)
Presentation of a topic in Russian literature.
Restriction: Permission of ARHU-School of Languages, Literatures, and Cultures department.
Repeatable to: 6 credits if content differs.

RUSS499 Independent Study in Russian (1-3 Credits)
Independent study under faculty supervision.
Prerequisite: Permission of instructor.
Repeatable to: 6 credits if content differs.

RUSS618 Special Topics in Linguistic Analysis of Russian (3 Credits)
Aspects of Russian linguistics such as stress, verbal, tense, taste, word order, or problems in lexical semantics.
Prerequisite: Permission of ARHU-School of Languages, Literatures, and Cultures department.
Repeatable to: 6 credits if content differs.

RUSS619 Seminar in Linguistic Analysis of Russian (3 Credits)
Current research in Russian linguistic analysis.
Repeatable to: 6 credits if content differs.

RUSS673 History of the Russian Language (3 Credits)
Introduction to historical Russian grammar and phonological developments in Russian.

RUSS679 Special Topics in Slavic Linguistics (3 Credits)
Topics concerning contrastive, historical, and dialectical Slavic linguistics, in relation to our understanding of grammatical theory.
Prerequisite: Permission of ARHU-School of Languages, Literatures, and Cultures department.
Repeatable to: 6 credits if content differs.

RUSS798 Independent Study (1-3 Credits)
Prerequisite: Permission of ARHU-School of Languages, Literatures, and Cultures department.
Repeatable to: 6 credits if content differs.

RUSS799 Thesis Research (1-6 Credits)
Prerequisite: Permission of ARHU-School of Languages, Literatures, and Cultures department.
Repeatable to: 6 credits if content differs.

SLAA - Second Language Acquisition and Application

SLAA498 Second Language Research and Practicum (1-3 Credits)
Individualized research and practicum for undergraduate students to work as Undergraduate Research Assistants (UGRA) on existing projects under the supervision of a PhD Graduate Supervisor (GS) in the area of second language acquisition to learn/experience how second language as well as psycholinguistic research is conducted.
Restriction: Permission of ARHU-School of Languages, Literatures, and Cultures department.
Repeatable to: 9 credits if content differs.
Additional Information: UGRAs register for 1-3 credits. A specific weekly schedule will be determined at the beginning of the semester. Throughout the semester, students will meet with the Graduate Supervisor (GS) once per week to discuss the theoretical and methodological background of the project as well as the broader area behind the research. In addition to the training in theoretical background, the first several weeks of the semester will be devoted to hands-on details of running subjects using a particular method and analyzing data. When this training is complete, UGRAs will work more independently to schedule and run research projects and process the data.

SLAA610 Research and Theories in Second Language Acquisition (3 Credits)
Introduction to current theories and research findings Second Language Acquisition (SLA).

SLAA611 Fundamentals of Foreign Language Acquisition and Instruction (3 Credits)
Introduction to theoretical and practical issues relevant to foreign language learning, language acquisition, and curriculum construction.

SLAA620 Second Language Research Methodologies (3 Credits)
An exploration of research methodology in second language acquisition (SLA), with a focus on developing practical skills in data analysis and interpretation. Preparation in both critical evaluation of existing research and design of new research models.
Prerequisite: SLAA610; and must have completed or be concurrently enrolled in SLAA611.

SLAA629 Special Topics in Sociolinguistics (3 Credits)
Current topics in research in sociolinguistics.
Repeatable to: 9 credits if content differs.

SLAA630 Second Language Testing (3 Credits)
An introduction to basic concepts in the assessment of second language knowledge. Issues of reliability, dependability, construct validity, utility, and washback on instruction are examined.
Prerequisite: SLAA610; or permission of ARHU-School of Languages, Literatures, and Cultures department.

SLAA639 Special Topics in Applied Linguistics (3 Credits)
Current topics in research in applied linguistics.
Repeatable to: 9 credits if content differs.

SLAA640 Psycholinguistics (3 Credits)
An introduction to the field of psycholinguistics that covers speech perception, word recognition, sentence and discourse processing, speech production, and language acquisition. Basic concepts, research methods, major research topics, leading theories and related research findings, with implications of psycholinguistic theories and findings for second language studies.
Prerequisite: SLAA610; or permission of ARHU-School of Languages, Literatures, and Cultures department.

SLAA649 Special Topics in Second Language Acquisition (3 Credits)
Current topics in research in second language acquisition.
Repeatable to: 9 credits if content differs.

SLAA650 Second Language Analysis (3 Credits)
An overview of the field of linguistics with a particular attention to its application in SLA studies, introduces students to the basic concepts and skills related to the scientific study of language, and provides them with opportunities to apply these concepts and skills in the analysis of language. It covers topics such as phonetics, phonology, morphology, syntax, semantics, language acquisition, and language use.
Prerequisite: SLAA610; or permission of ARHU-School of Languages, Literatures, and Cultures department.

SLAA719 Second Language Acquisition and Application Internship (3 Credits)
Internship at a site to be determined. Topics may include heritage language learning, immersion education, testing and assessment, translation and interpretation, and national language planning and policy.
Repeatable to: 6 credits if content differs.

SLAA741 Cognitive Processes in Second Language Learning (3 Credits)
Examines the roles played by varied types of learning processes and memory, general processing issues, and the cognitive bases of individual differences in learning and processing a second language.
Prerequisite: SLAA610; or students who have taken courses with comparable content may contact the department.

SLAA742 Second Language Processing (3 Credits)
Covers leading theoretical approaches and experimental methods in second language processing. Draws on research and theories in Second Language Acquisition (SLA), formal linguistics, cognitive grammar, psycholinguistics, and neurolinguistics.
Restriction: Permission of instructor required for MA students.

SLAA744 Age Effects in Second Language Learning (3 Credits)
Consideration of the empirical evidence for age effects in second language learning and its potential confounds. Critical evaluation of the differing interpretations of these effects and their implications for educational practice, SLA theory, development psychology, and research methodology.
Prerequisite: SLAA610.
Restriction: Permission of instructor.

SLAA749 Special Topics in Second Language Learning (3 Credits)
Current topics in research on Second Language Learning.
Prerequisite: SLAA620.
Restriction: Must be in the Second Language Acquisition PhD program; or permission of instructor.
Repeatable to: 9 credits if content differs.
Additional Information: Students in the Second Language Acquisition MA program may enroll with permission.

SLAA750 Instructed Second Language Acquisition (3 Credits)
Survey of studies on effectiveness of SLA instruction within various domains of language, with focus on research design.
Prerequisite: SLAA610.

SLAA754 Task-Based Language Teaching (3 Credits)
Overview of Task-Based Language Teaching (TBLT) including needs and means analysis, syllabus design, materials writing, methodology and pedagogy, testing, and evaluation. Theoretical issues addressed include relationship of TBLT to research findings on the psychology of learning and SLA and libertarian approaches to education.

SLAA759 Special Topics in Second Language Instruction (3 Credits)
Topics in the theory and practice of second language instruction.
Repeatable to: 12 credits.

SLAA760 Fundamentals of Second Language Assessment (3 Credits)
An overview of current assessment models in foreign and second language learning.
Prerequisite: SLAA610.

SLAA779 Directed Research in Second Language Acquisition and Application (1-3 Credits)
Directed independent research in Second Language Acquisition or Application. In this capstone project, students engage in independent research under faculty direction.
Repeatable to: 3 credits if content differs.

SLAA798 Master's Independent Study (1-3 Credits)
Repeatable to: 6 credits if content differs.

SLAA799 Master's Thesis Research (1-6 Credits)

SLAA888 Doctoral Independent Study (1-3 Credits)
Individual instruction course.
Prerequisite: Permission of ARHU-College of Arts & Humanities.
Repeatable to: 9 credits if content differs.

SLAA898 Pre-Candidacy Research (1-8 Credits)

SLAA899 Doctoral Dissertation Research (1-8 Credits)

SLLC - School of Languages, Literatures and Cultures

SLLC400 Articulatory Phonetics for Second Language Acquisition and Application (3 Credits)
The mechanical capabilities of the human vocal apparatus for producing speech sounds, and their terminology and transcription in the International Phonetic Alphabet. Emphasis is on the practical needs of the teacher and student of foreign language, rather than the theoretical linguist or the hearing-and-speech pathologist. The phonetics of major languages are also introduced, with attention to the pedagogy of their phonetics.
Restriction: Junior standing or higher.

SLLC410 Documentary and Narrative (3 Credits)
An examination of the relationship between film and reality, focusing on documentary film.
Prerequisite: ENGL245, FILM245, or CINE245; or permission of ARHU-School of Languages, Literatures, and Cultures department.
Cross-listed with: CINE410.
Credit Only Granted for: SLLC410, CINE410 or FILM410.
Formerly: FILM410.

SLLC411 Experimental Film (3 Credits)
Introductory survey of European and U.S. American experimental cinema.
Cross-listed with: CINE411.
Credit Only Granted for: SLLC411, CINE411 or FILM411.
Formerly: FILM411.

SLLC461 Political Cinema (3 Credits)
Histories of cinema and politics in the 20th century.
Prerequisite: ENGL245, FILM245, or CINE245; or permission of ARHU-School of Languages, Literatures, and Cultures department.
Cross-listed with: CINE461.
Credit Only Granted for: CINE461, FILM461 or SLLC461.
Formerly: FILM461.

SLLC463 Screening Time: History and Memory in Cinema (3 Credits)
An examination of the ways and techniques with which cinema produces a sense of time in the viewer.
Prerequisite: ENGL245, FILM245, or CINE245; or permission of ARHU-College of Arts & Humanities.
Cross-listed with: CINE463.
Credit Only Granted for: SLLC463, CINE463 or FILM463.
Formerly: FILM463.

SLLC468 Special Topics in Film Studies II (3 Credits)
Exploration of topics in film studies beyond national traditions, for example through the lens of theory, genre, auteurship, aesthetic movements in cinema, and/or comparative perspectives. Courses at the 400-level have higher expectations of independent work, including reading and written assignments.
Repeatable to: 12 credits if content differs.

SLLC471 The Cultural Environment of Global Business (3 Credits)
The goal of this course is to provide students with an understanding of cultural aspects pertaining to global business, and thereby increasing their awareness of the cultural factors that motivate decisions and behavior in the business world. Students will gain an understanding of how the business cultures in the rest of the world diverge from the American, and develop the cultural understanding, attitudes, and communication skills needed to function appropriately within an increasingly global and multicultural working environment.
Restriction: Sophomore standing or higher.
Credit Only Granted for: ARHU439B, ARHU439E, ARHU439T, ENES472, SLLC471, or SLLC473.
Formerly: ARHU439B.

SLLC473 European Business Cultures (3 Credits)
The goal of this course is to provide students with an understanding of cultural aspects pertaining to European business, and thereby increasing their awareness of the cultural factors that motivate decisions and behavior in the European business world. Students will gain an understanding of how the European business cultures diverge from the American, and develop the cultural understanding, attitudes, and communication skills needed to function appropriately within an increasingly global and multicultural working environment.
Restriction: Sophomore standing or higher.
Credit Only Granted for: ARHU439B, ARHU439E, ARHU439T, ENES472, SLLC471, or SLLC473.
Formerly: ARHU439E.

SLLC499 Special Topics in World Cultures (3 Credits)
Interdisciplinary, transnational or cross-language course; specific topic to be announced.
Repeatable to: 12 credits if content differs.

SLLC698 Special Topics in Interdisciplinary Studies (1-3 Credits)
Cross-departmental or cross-programmatic study within the School of Languages, Literatures, and Cultures. Topic to be announced when course is offered.

SLLC789 Master's Independent Study (1-3 Credits)
Restriction: Permission of instructor.
Repeatable to: 6 credits if content differs.

SLLC878 Pedagogical Mentoring for Doctoral Students (1 Credit)
Pedagogical mentoring by faculty members for doctoral students who have completed their first semester of TA training.
Prerequisite: SLLC601; and permission of ARHU-School of Languages, Literatures, and Cultures department.
Repeatable to: 8 credits if content differs.

SLLC889 Doctoral Independent Study (1-3 Credits)
Repeatable to: 6 credits if content differs.

SOCY - Sociology

SOCY401 Intermediate Statistics for Sociologists (3 Credits)
This is a course about multiple regression for undergraduate students and presumes that students taking this course will be both producers and consumers of multiple regression results. Students will work with the instructor to produce a research poster presentation based on secondary social science data. In addition to multivariable statistics, students will learn some statistical programming as well as how to organize a research presentation.
Prerequisite: SOCY201 and SOCY202; or permission of the Sociology department.
Restriction: Must not have completed STAT400, BMGT231, or ENEE324.

SOCY407 Explaining Social Change: Fact and Fiction in Understanding Why Our World Looks the Way it Does (3 Credits)
Examines large-scale processes of social change that have produced durable and defining aspects of our contemporary world and asks, How did we get here? It focuses on four key issues: how markets and the pursuit of profit came to organize virtually all aspects of material life and restructured societies around social classes; how democratic forms of governance emerged to direct states and the persistent challenges presented by authoritarian rule; how social revolution erupts and what kinds of changes it yields; and how warfare between states can produce varieties of change not necessarily comprehended in the foregoing domains.
Prerequisite: 6 credits in SOCY courses or permission of Sociology Department.
Credit Only Granted for: SOCY498Y or SOCY407.
Formerly: SOCY498Y.

SOCY410 Social Demography (3 Credits)
Demography is the scientific study of human populations including their size, distribution, composition, and the processes that change these characteristics. Social demography examines how population processes interrelate with institutions in society, such as the family and the economy.
Prerequisite: 6 credits in SOCY courses; or permission of BSOS-Sociology department.

SOCY411 Demographic Techniques (3 Credits)
This is a survey course in techniques that are widely used in demographic analysis. These include techniques that describe population structure and change, that analyze fertility, mortality, and migration, and that evaluate demographic data. In addition, many of the analytic skills and techniques of the course have more general applicability in social science and population health research.
Prerequisite: SOCY201 and SOCY410; or permission of the Sociology department.

SOCY412 Family Demography (3 Credits)
Family and population dynamics. Fertility issues, such as teenage pregnancy, the timing of parenthood, and family size, as they relate to family behavior, such as marital patterns, child care use, and work and the family. Policy issues that relate to demographic changes in the family.
Prerequisite: SOCY201 and SOCY202; or permission of the Sociology department.

SOCY413 Sociology of Aging (3 Credits)
The aging of the population is one of the major demographic changes affecting social institutions during the next century. Research demography, sociology, economics, epidemiology, psychology and public health are integrated to develop a broader understanding of the causes and consequences of population aging. A central focus is the diversity of experiences by age, gender, socioeconomic status and health.
Prerequisite: SOCY201 and SOCY202; or permission of the Sociology department.

SOCY415 Environmental Sociology (3 Credits)
Overview of the field and theoretical themes within the area of environmental sociology and technology. Current issues are explored including: environmental attitudes; environmental movements; environmental justice; globalization; global climate change; and garbage and food.
Prerequisite: 6 credits in SOCY courses.

SOCY418 Research in Family & Demography (3 Credits)
This is a special topics research course for Family and Demography.
Prerequisite: SOCY201 and SOCY202; or permission of the Sociology department.
Repeatable to: 6 credits if content differs.

SOCY420 Qualitative Research Methods in Sociology (3 Credits)
Using the sociological imagination to independently explore research questions as designed by students. Readings will explore dilemmas qualitative researchers confront such as, how to conduct research ethically and how their background influences their findings and analysis. Students will learn how to collect data, analyze it, and present it to others.
Prerequisite: SOCY201 and SOCY202; or permission of the Sociology department.

SOCY424 Sociology of Race Relations (3 Credits)
Encourages sociological thinking about US racial and ethnic minority populations, with a focus on African Americans, Latinos, Asian Americans, and Native Americans. The central concern is to understand and explain racial/ethnic inequality. A wide array of topics are discussed, including prejudice and discrimination, slavery, residential segregation, cultural inequality, skin tone stratification, economic and educational disparities, and assimilation/generational processes.
Prerequisite: 6 credits in SOCY courses; or permission of the Sociology department.
Cross-listed with: AAST424.
Credit Only Granted for: SOCY424 or AAST424.

SOCY428 Research in Inequality (3 Credits)
This is the special topics research course for Stratification and Inequality.
Prerequisite: SOCY201 and SOCY202; or permission of the Sociology department.
Repeatable to: 6 credits if content differs.

SOCY431 Principles of Organizations (3 Credits)
Structural and processual characteristics of organizations that make them effective for different purposes and in different environments. Effects of different institutional environments, small group processes, organizational networks, and leadership. Types of organizations studied include formal bureaucracies, professional organizations, and voluntary associations.
Prerequisite: SOCY201 and SOCY202; or permission of BSOS-Sociology department.

SOCY432 Social Movements (3 Credits)
This course broadens students' understanding of social movements in the United States. Many topics are discussed, including the emergence of social movements, why people join social movements, collective identity, gender, culture, emotions, tactics, repression, and the decline of social movements. Various movements are reviewed, including the civil rights movement, the Chicano movement, the women's movement, the LGBTQ movement, the white power movement, the American Indian movement, and the animal rights movement.
Prerequisite: 6 credits in SOCY courses; or permission of BSOS-Sociology department.

SOCY433 Social Movements and Race (3 Credits)
This course aims to broaden our understanding of racial and ethnic minority social movements in the United States. We will often reference protests by African Americans and Latinos, such as by focusing on slave resistance, the modern civil rights movement, and Chicano movements. We will discuss various topics, including movement emergence, why people join and pick their tactics, government repression, movement outcomes, and movement decline. We will interrogate ways that movement processes and theoretical tools may be racially variant and strive to uncover how approaches used by scholars who study race (e.g., intersectionality, critical race theory, racialization) can be applied, and perhaps challenge, traditional social movement scholarship.
Prerequisite: 6 credits in SOCY courses; or permission of BSOS-Sociology department.

SOCY435 Society, Biology, and Health (3 Credits)
It is not too far-fetched to speak of the pancreas under capitalism or the proletarian lung. Humans are social beings in physical bodies. In this course, we draw on research studies, podcasts, news articles, and best-selling non-fiction to inform conversation and writing on how various dimensions of human biology influence, and are influenced by, our social and cultural environment. We focus on conceptualizing human behavior as an interplay between both nature and nurture, and consider how this approach changes our understanding of modern social problems. This course is appropriate for students with a range of backgrounds in the social and natural sciences; introductory-level supplemental readings on all necessary biological concepts will be provided.
Prerequisite: Must have completed 6 credits in SOCY courses or permission of BSOS Sociology Department.

SOCY441 Social Stratification and Inequality (3 Credits)
The sociological study of social class, status, and power. Topics include theories of stratification, correlates of social position, functions and dysfunctions of social inequality, status inconsistency, and social mobility.
Prerequisite: 6 credits in SOCY courses; or permission of BSOS-Sociology department.
Restriction: Junior standing or higher.

SOCY442 The Black Middle Class (3 Credits)
Students will learn about the Black Middle Class. They will examine and explore the historical context that led to the rise of a Black Middle Class. Innovative avenues into the Black Middle Class will also be examined, including various household and family formations. Finally, the course will cover the consequences of being in the The Black Middle Class, with an emphasis on residential segregation and racial identity.
Prerequisite: 6 credits in SOCY courses.

SOCY445 Sex and Love in Modern Society (3 Credits)
Sociological theories of sex and gender are used to explore empirical research on women's and men's sexual behavior and attitudes; variation in gendered sexuality by key social characteristics and how gendered sexuality is constructed and controlled; changes in sexuality over time and across relationship types, focusing on changes in sexual desire and behaviors and on the changing meaning of sex and marriage in U.S. society and other countries. Contemporary debates about sexuality will also be examined.
Prerequisite: SOCY201, SOCY202, SOCY203, and SOCY230.
Restriction: Must be in Sociology program; or permission of BSOS-Sociology department.

SOCY450 Investigating Women's Empowerment in Low and Middle Income Countries (3 Credits)
Students in this course will learn how the study of women's empowerment in low and middle income countries (LMICs) has developed, its current state of measurement, and new avenues to pursue in the future. Examining the extensive research on gender-based inequalities in educational attainment, employment rates, and health status, students will investigate how power imbalances across individuals, households, and institutional factors result in persistent inequality. Bringing an intersectional perspective to the forefront of the course, we will study how to design effective intervention policies that seek to improve the daily lives of women, girls and their families.
Prerequisite: SOCY201 and SOCY202; or permission of BSOS-Sociology department.

SOCY451 Sociology of Culture (3 Credits)
Analyzes the relationship between society and culture. How do social forces affect cultural objects and products? How do values and meanings shape individual behavior? How can culture be both a source of domination and resistance? These and other topics will be analyzed to show the role of culture in our lives.
Prerequisite: 6 credits in SOCY courses; or permission of the department.
Credit Only Granted for: SOCY498C or SOCY451.
Formerly: SOCY498C.

SOCY452 Sociology of Mental Health (3 Credits)
The class focuses upon the larger question: "What is the balance between people being mentally 'ill' and us having a 'sick' society?" To explore this question, students will utilize sociological approaches toward mental illness and health. This will manifest as a focus on how social organization is related to mental health and illness. Students will consider how sociologists understand the nature, distribution, and treatment of mental illness and health in society, and will develop a personal understanding of what it means to be mentally healthy.
Prerequisite: 6 credits in SOCY courses; or permission of the department.
Credit Only Granted for: SOCY498O or SOCY 452.
Formerly: SOCY498O.

SOCY453 Racial Residential Segregation (3 Credits)
Examines how race and ethnicity have historically shaped residential patterns in the U.S. and their continuing importance today. Students will investigate the causes of residential segregation, including residential preferences, discrimination, and socioeconomic differences between racial and ethnic groups. Significant attention will be paid to how immigration and ensuing ethnic and racial diversity are reshaping the residential landscape. The readings highlight the U.S. context, though residential patterns in different countries are also briefly discussed.
Prerequisite: 6 credits in SOCY courses; or permission of the department.
Credit Only Granted for: SOCY498D or SOCY453.
Formerly: SOCY498D.

SOCY455 Social Dimensions of Privacy and Surveillance (3 Credits)
Today, it is quite common in many spheres of life that we divulge personal information in exchange for something else. This course examines practices of surveillance in contemporary society in relationship to collective understandings of privacy. By the end of this course, students will be able to analyze privacy norms and practices in the age of mass surveillance, how surveillance produces inequalities in relation to privacy, and how definitions and regulations of privacy and surveillance change over time.
Prerequisite: 6 credits in SOCY courses; or permission of the department.
Credit Only Granted for: SOCY391 or SOCY455.

SOCY456 Smart Machines and Human Prospects (3 Credits)
Artificial intelligence is everywhere and never sleeps. It is transforming our social institutions in intended and unintended ways. While scientists debate the feasibility of engineering conscious machines with general intelligence, no one debates that the global race is on to create more potent computers. Through targeted research, discussion, and presentation of findings students will answer a specific question on how, where, and in what ways society is being changed by smart machines.
Prerequisite: SOCY201 and SOCY202; or permission of the Sociology department.
Credit Only Granted for: SOCY416 or SOCY456.

SOCY457 Sociology of Law (3 Credits)
Students will be introduced to sociological theories and frameworks used to examine how the law shapes society and how society shapes the law. Students will explore various approaches to jurisprudence influenced by sociology and investigate: how different social theorists have interpreted the role of law in society, whose interests the law serves, and the law's role in societal transformation. The course will enable students to understand how the law influences and is influenced by power, social change, legitimacy, compliance, deterrence, social reproduction, and inequality (including race, class, gender, and sexuality).
Prerequisite: 6 credits in SOCY courses; or permission of BSOS-Sociology department.

SOCY458 Special Topics in Study Abroad IV (1-6 Credits)
Special topics course taken as part of an approved study abroad program.
Repeatable to: 15 credits if content differs.

SOCY461 Sociology in Action: Research and Community Engagement in Prince George's County (3 Credits)
Sociology in Action is a research course that will use the science of sociology to inform real life issues and contribute to the development of social programs. In this course, students will gain hands-on experience in applying sociology by working with clients in Prince George's County on specific social problems and issues. Please assess your ability to commit to this course and fulfill all requirements. Given that students will be working with Prince George's County organizations, there will be some variation and unpredictability in the nature of the projects.
Prerequisite: SOCY202; or students who have taken courses with similar content may contact the department.

SOCY462 Digital Technology and Society (3 Credits)
Situates digital technology in our social environment and then examines how this relationship reflects, reinforces, or reorders social hierarchies. Students will learn the conceptual and methodological foundations for studying and evaluating how technologies such as health and social media apps, the personal computer, artificial intelligence, and weapons of war have evolved, diffused and impacted social life. Students will explore and then conduct independent research on the relationship between technology and social inequalities through the lens of health and medicine, the environment and climate change, jobs and the workplace, as well as government and criminal justice.
Prerequisite: Must have completed 6 credits in SOCY courses; or permission of BSOS-Sociology department.

SOCY463 Sociology of Masculinity: How Much Has Masculinity Really Changed? (3 Credits)
An examination of the history both feminist social movements and feminist sociology in a specific way. It uses the sociological subfield of men and masculinities as a keyhole through which we will study 'the stalled revolution' for women's equality. Along the way, we will familiarize ourselves with academic and popular reports about changing and contested definitions, ideas, and behaviors of masculinity.
Prerequisite: 6 credits in SOCY courses; or permission of BSOS Sociology department.

SOCY465 The Sociology of War: State and Society since the American Revolution (3 Credits)
Since the American and French Revolutions at the end of the eighteenth century, warfare has been marked by the way national states draw ordinary people into armed conflicts–as members of the military, producers and controllers of resources and supporters or resisters, and also as targets and victims. This course examines how the centering of ordinary people in war has transformed over time, continuing right up to the current conflict in Ukraine. Alongside explaining why states make war the way they do, the course explores the impacts of making war and living through conflict on the societies embroiled in it.
Prerequisite: Must have completed 6 credits in SOCY courses; or permission of BSOS-Sociology department.
Credit Only Granted for: SOCY465 or SOCY265.

SOCY467 Sociology of Education (3 Credits)
Students will examine educational institutions from a sociological perspective by analyzing the latent and manifest functions of schooling. Students will study schools as structured organizations; investigate the various roles and subcultures present among teachers and students; and explore educational disparities in access and achievement.
Prerequisite: 6 credits in SOCY courses; or permission of BSOS-Sociology department.

SOCY470 Pregnancy and Parenthood in an Unequal Society (3 Credits)
Analysis of patterns in sexual activity, contraceptive use, and unintended pregnancy, and how they reinforce or alleviate socioeconomic, gender, and racial inequalities. Emphasis on the role of healthcare providers and contraceptive access, attitudes about motherhood and contraception, policy interventions, and institutional designs. Social and economic consequences of increasing women's ability to control their fertility.
Prerequisite: 6 credits in SOCY courses; or permission of Sociology Department.

SOCY475 Sociology of Emotions (3 Credits)
Emotions are often thought of as purely subjective experiences. How much more personal than one get than their emotions and feelings? In addition to their physiological and psychological aspects, however, emotions have a social side that often go unnoticed. This course will introduce you to the social aspects of emotions. In doing so, we will cover wide-ranging topics including the social causes of emotions, social norms about emotions, disparities in emotionalexperiences, and the ways in which emotions can maintain and reshape society.
Prerequisite: 6 credits in SOCY courses; or permission of BSOS-Sociology Department.
Credit Only Granted for: SOCY498W or SOCY475.
Formerly: SOCY498W.

SOCY480 Researching the Middle East (3 Credits)
Introduces religion, gender, and politics in the Middle East and North Africa. After an overview of the political and social history the focus will be on methods for carrying out research on fundamental issues facing Middle Eastern societies, including national identity, religion, gender relations and the status of women in the family, politics, education, and labor market.
Prerequisite: SOCY201 and SOCY202; or permission of the Sociology department.

SOCY481 Ideology and Social Conditions in the Making of Terrorism in the Middle East and North Africa (3 Credits)
The sociology of terrorism and political violence in the Middle East and North African will be explored in this course.
Prerequisite: Must have completed 6 credits in SOCY courses or permission of the Sociology department.
Restriction: Sophomore standing or higher.

SOCY490 Experimental Research Practicum (3 Credits)
Hands-on experience in designing, conducting, and analyzing experimental research. Introduces students to causal inference in social scientific research, focusing on experimental designs. Students will get hands-on research experience running experimental studies in the group processes lab. Students will also work with the professor and graduate students in the department to develop a research idea that can be executed in the spring semester.
Prerequisite: SOCY201 and SOCY202; or permission of the Sociology department.
Additional Information: This is the first course in the experimental research practicum 2-course sequence.

SOCY491 Experimental Research Design (3 Credits)
Students will finalize the design of their studies from the fall semester and carry out the research in this course. Introduces students to analyzing experimental data and presenting results from these data. Students will continue to get hands-on research experience running experimental studies in the group processes lab and working with the professor and graduate students in the department to further develop their projects.
Prerequisite: SOCY201, SOCY202 and SOCY490; or permission of BSOS-Sociology department.
Additional Information: This is the second course in the experimental research practicum 2-course sequence.

SOCY498 Selected Topics in Sociology (1-3 Credits)
Topics of special interest to advanced undergraduates in sociology. Such courses will be offered in response to student request and faculty interest.
Prerequisite: SOCY201 and SOCY202; or permission of BSOS-Sociology department.
Repeatable to: 6 credits.

SOCY601 Statistics for Sociological Research I (4 Credits)
Covers calculation and interpretation of descriptive and inferential statistics, including Chi-square, ANOVA, correlation, and bivariate and multivariable OLS regression. Students will be introduced to applied data analysis using Stata statistical software.
Restriction: Must be in one of the following programs: (Sociology (Doctoral); Sociology (Master's)) ; or permission of instructor.

SOCY602 Statistics for Sociological Research II (4 Credits)
This course introduces regression analysis using matrix algebra. Topics include bivariate regression, multivariate regression, tests of significance, regression diagnostics, indicator variables, interaction terms, extra sum of squares, and the general linear model. Other topics may be addressed such as logistic regression and path analysis. Statistical programming software may be used.
Restriction: Must be in one of the following programs: (Sociology (Doctoral); Sociology (Master's)) ; or permission of instructor.

SOCY609 Practicum in Social Research (3 Credits)
The conduct of research in collection and analysis of social science data under the guidance of experienced investigators. Emphasis on a particular research area of procedure, e.g. secondary analysis of survey data; experimental design; evaluation of research; data collection techniques.
Restriction: Permission of instructor.

SOCY610 Logic of Social Inquiry (3 Credits)
An introductory course on the fundamental issues that arise in the design, execution, analysis, and writing stages of the research process. The course is designed to help first-year graduate students begin their transition from a consumer to a producer of social research.
Restriction: Restricted to Sociology graduate students.
Credit Only Granted for: SOCY699D or SOCY610.
Formerly: SOCY699D.

SOCY611 Introduction to Demographic Methods (3 Credits)
Survey of standard demographic methods for the description and analysis of population size, structure and composition, including techniques for the analysis of fertility, mortality and migration.

SOCY612 Families and Modern Social Theory (3 Credits)
Designed to build knowledge about theories of modernity, with emphasis on modern families. Thus, it combines some core theories of modernity (Giddens, Bourdieu, Foucault), with key theoretical debates about families and intimate relationships (economics and economic sociology, gender, race, class), and social change (development and new family forms).
Credit Only Granted for: SOCY699F or SOCY612.
Formerly: SOCY699F.

SOCY613 Social Movement Theory (3 Credits)
The objective of this course is to introduce students to the field of social movements, with an emphasis on understanding theoretical tools within the field. To accomplish this, students will review theories on social movements including Karl Marx, breakdown approaches, resource mobilization and political process theory, dramaturgy, and new social movement theory. Students will also devote considerable attention to core concepts in the field, including social networks, political opportunity structure, repression, framing, collective identity, and movement outcomes.
Credit Only Granted for: SOCY699R or SOCY613.
Formerly: SOCY699R.

SOCY616 Sociology Pro-Seminar (1 Credit)
The proseminar is the guide to Sociology as a profession, and how sociology is practiced here at the University of Maryland. The goal of the course is to help students gain insider knowledge about how to develop sociological knowledge and capabilities, and what it means to practice sociology as a graduate student and beyond. The course will discuss both practical aspects of professional life in general and specific topics of interest.
Restriction: Must be in Sociology (Doctoral) program.
Credit Only Granted for: SOCCY699P or SOCY616.
Formerly: SOCY699P.

SOCY617 Second-Year Paper Seminar (3 Credits)
This course is intended to help Sociology PhD students develop a successful second-year paper or another research paper equivalent in scope. It will also enhance students' ability to evaluate and constructively critique the work of others.
Restriction: Restricted to Sociology PhD students.

SOCY618 Computer Methods for Sociologists (3 Credits)
Designed to present the potential of the computer as a tool in sociological research. Projects involving programming and running of data manipulation techniques, statistical techniques, and simple simulations.
Prerequisite: SOCY401; or students who have taken courses with comparable content may contact the department. And must have elementary knowledge of a programming language; or CMSC120; or students who have taken courses with comparable content may contact the department.
Restriction: Permission of instructor.

SOCY620 Classical Sociological Theory (3 Credits)
Examines key texts in the emergence of social theory as a coherent body of thought, defined in part by the idea that society has a distinctive logic of its own that comes from society itself. Students will read works by Adam Smith, Alexis de Tocqueville, Karl Marx, Georg Simmel, Emile Durkheim, Max Weber, Simone de Beauvoir, WEB DuBois, and Karl Polanyi. Through close reading and discussion, students will trace the development of sociological theory from its origins in the latter 18th century through the founding of the discipline of Sociology in the early 1900s to the recasting of central understandings that emerged around the middle of the 20th century.
Prerequisite: SOCY203 or SOCY403; or students who have taken courses with comparable content may contact the department; or permission of instructor.

SOCY621 Contemporary Sociological Theory (3 Credits)
Emphasizes theory as an active part of sociologists' working toolkit. We read contemporary theory and also examine how it is used in empirical studies. Students read works from so-called "reproduction theorists" (Bourdieu), post-structural theorists, critical race theorists, post-colonial theorists, western feminists and post-colonial feminists, symbolic interactionists, and institutional theorists. We learn to view theory as a draft in progress, which we should feel empowered to revise given new empirical data from our changing world. Theory should inform our own research design, but our job as researchers is ultimately to continually revise and refine it.
Prerequisite: SOCY620, SOCY203, or SOCY403; or permission of instructor.

SOCY623 Families and Modern Social Theory (3 Credits)
Modern families will be explored by combining core theories of modernity with key theoretical debates about families and intimate relationships (economics and economic sociology, gender, race), and social change (development and new family forms).
Restriction: Must be in one of the following programs (Sociology (Doctoral); Sociology (Master's)) ; or permission of instructor.

SOCY625 Activism and Global Movements (3 Credits)
An introduction to the research on activism, focusing particularly on the global and transnational aspects of activism and social movements. The course begins with an overview of the theoretical literature on activism and social movements. Then, we will focus on case studies of particular movements that have a global component and have been the focus of recent sociological inquiry: the globalization movement, Arab Spring, and the climate/climate justice movement.
Restriction: Must be enrolled in a Sociology (SOCY) graduate program; or permission of instructor.

SOCY626 Demography of Aging (3 Credits)
Examines the demographic foundations of population aging, focusing on macro and historical patterns as well as on trends in mortality health and disability. Also examines the relationship between aging and social institutions such as the family, the economy and public policy.

SOCY627 Migration (3 Credits)
Examines theories of immigration and immigrant adaptation, empirical patterns of migration and immigration, the economic and social effects of immigration, as well as immigration policy issues.

SOCY630 Population and Society (3 Credits)
Selected problems in the field of population; quantitative and qualitative aspects; American and world problems.

SOCY633 Qualitative Research Methods II, Field Research (3 Credits)
As the second course in the qualitative methods sequence, students are expected to have a general knowledge of qualitative methods. Students should have already learned how to collect and analyze qualitative data using interview and ethnographic methods. Student will spend this semester collecting and analyzing qualitative data and must begin the course with a formulated research question, a plan for data collection and sampling. Each student will spend the first two weeks preparing a proposal for submission the the University of Maryland's Institutional Review Board to gain Human Subjects approval to collect data. Then, students will spend a month collecting data, a month analyzing data using QSR NVivo, which will be taught as part of the coursework, and writing up the findings. The end product of the course will be an empirical paper based on the data collected and analyzed throughout the semester.
Prerequisite: SOCY632; or students who have taken courses with comparable content may contact the department.

SOCY634 Attitudes and Public Opinion (3 Credits)
Processes involved in the formation of attitudes; effects of communication; measurement techniques.

SOCY635 Social Aspects of Fertility (3 Credits)
Demographic and socioeconomic aspects of fertility behavior; causes and consequences of fertilty decline; relationship between women's status and fertility; determinants of adolescent and nonmarital fertility; differential fertility by race/ethnicity and migration status.
Restriction: Permission of instructor.

SOCY637 Demography Of The Labor Force (3 Credits)
Demographic trends as related to the composition of the U.S. labor force and trends in income; employment status of immigrants, women, and minorities; relationship between skills and jobs; types of data available for study of the labor force.
Restriction: Permission of instructor.

SOCY641 Leadership in Diverse Organizations (3 Credits)
Provides students with a practical understanding of leadership and a framework for understanding three key conditions from which effective leadership emerges: timing, organizational characteristics, and individual characteristics. We will consider different dimensions and/or styles of leadership, as well as the methods effective leaders use to build solidarity within groups and organizations.
Restriction: Must be in one of the following programs: Criminology and Criminal Justice (Master's); Criminology and Criminal Justice (Doctoral); Sociology (Master's); Sociology (Doctoral); or permission from either the Sociology Department or Criminology & Criminal Justice Department.

SOCY642 The Sociology of Mental Health (3 Credits)
Social factors that influence mental health. Group dynamics of mental health preservation.

SOCY643 Power and Status in Organizations (3 Credits)
Organizations affect virtually every aspect of modern social life. The impact and reach of public safety organizations--those special entities purportedly designed to maintain order and safety--are particularly influential. Although sociologists, psychologists, economists, and management scholars all examine the workings of status and power within organizations, our perspective will be primarily sociological as we explore how power and status operate within the context of organizations.
Restriction: Must be in one of the following programs: Criminology and Criminal Justice (Master's); Criminology and Criminal Justice (Doctoral); Sociology (Master's); Sociology (Doctoral); or permission from BSOS-Sociology department.

SOCY644 Gender, Work, and Family (3 Credits)
The interrelationships among gender, work, and family in contemporary societies. Major research issues addressed from an interdisciplinary and comparative (international) perspective.

SOCY645 Sociology of the Self Concept (3 Credits)
Theory and empirical research dealing with the social determination and social consequences of the self-concept. Sociological, psychological, and psychoanalytic approaches to the self.

SOCY646 Public Image Management and Policy Solutions (3 Credits)
Explores how to mitigate and solve image management problems that arise in organizations. Students will learn how to evaluate their organization, make recommendations for future development, and implement the practical aspects of the solution. Problems arise daily in organizations. Leaders need effective strategies to mitigate and solve these problems. While some problems are structural, daily problems often focus on social interactions among people. The course will focus on evaluating the source of problems, enhancing cultural competency among employees, restructuring and rebranding the organization, managing public image, and forming and implementing innovative policy solutions for long-term goals.
Restriction: Must be in one of the following programs: Master of Professional Studies in Public Safety Leadership and Administration (MPLA); Criminology and Criminal Justice (Master's); Criminology and Criminal Justice (Doctoral); Sociology (Master's); Sociology (Doctoral); or permission from either the Sociology Department or Criminology & Criminal Justice Department.

SOCY653 Family Demography (3 Credits)
Demograpic perspective on family and household relationships; relationships among economic institutions, family structure, and the content of family life; research from contemporary U.S., historical and cross-cultural sources.
Restriction: Permission of instructor.

SOCY656 Intersectionality and Population Health Disparities (3 Credits)
An intersectional examination of population health disparities.

SOCY657 Constitutional Law and Public Safety (3 Credits)
Introduces students to the constitutional issues inherent in the practice of policing. Particular emphasis is placed on issues pertaining to the 4th, 5th, and 6th Amendments.
Restriction: Must be in one of the following programs: Master of Professional Studies in Public Safety Leadership and Administration (MPLA); Criminology and Criminal Justice (Master's); Criminology and Criminal Justice (Doctoral); Sociology (Master's); Sociology (Doctoral); or permission from BSOS-Criminology & Criminal Justice department.

SOCY660 Theories of Social Psychology (3 Credits)
An introduction to some of the theories in social psychology that are particularly useful to sociologists. Topics to be covered include theories of cognitive consistency, social exchange, symbolic interaction, role theory, group processes, and collective behavior.
Prerequisite: Must have completed an undergraduate training in sociological research methods, statistics, and theory; or students who have taken courses with comparable content may contact the department.

SOCY661 Social Stratification (3 Credits)
Major theoretical and research problems in the sociology of social stratification. The characteristics, correlates, and consequences of class and status stratification; the distribution of power; the relationship of social stratification to ideology and the institutional orders of society.
Restriction: Permission of instructor.

SOCY670 Applied Research Methods and Technological Training Approaches (3 Credits)
Introduces students to the purpose, methodology, analysis, and ethics of social science research, especially in the areas of criminal justice and law enforcement. Students will engage in the research process from developing a research question, designing, and conducting a thorough research study, and collecting data for analysis and findings. Both qualitative and quantitative research models will be shared to facilitate students' learning around methodological inquiry and interpretation, including survey design, literature reviews, and report writing. Additionally, students will be exposed to contemporary models impacting law enforcement and public officials, such as algorithmic bias, facial recognition, and individual and community surveillance. At the end of the course, students will be expected to complete a research paper after submission of a research proposal to complete course requirements.
Restriction: Must be in one of the following programs: Public Safety Leadership and Administration (MPS); Leadership in Diverse Organizations certificate; Criminology and Criminal Justice (Master's); Criminology and Criminal Justice (Doctoral); Sociology (Master's); Sociology (Doctoral); or permission from BSOS-Sociology department.

SOCY673 Sociology of Gender (3 Credits)
This graduate seminar is an introduction to the broad field of sociology of gender. The focus of the seminar is, first, to examine gender as a multilevel system of social practices that construct and reinforce the gender binary, which functions as a master binary that creates "women" and "men" as two different and unequal categories through processes that instill and reinforce gendered identities, interactions, and institutions. In the course, students will examine how gender intersects with other domains of inequality, particularly sexuality, race-ethnicity, social class, and nationality.

SOCY675 Sociology of Emotions (3 Credits)
Reviews the sociological literature on emotion. We will cover wide-ranging topics including the social causes of emotions, social norms about emotions, disparities in emotional experiences, and the ways in which emotions can maintain and reshape society.

SOCY681 Group Processes (3 Credits)
An overview of sociology's group processes perspective, one of the three "faces" of sociological social psychology. The group processes tradition focuses on fundamental social processes that occur in group contexts. These include power, status, legitimacy, emotion, identity, prosocial behavior, justice, and others. The course will attend to all of these areas, with a special focus on research that addresses inequalities by race, gender, and class that are manifested in or exacerbated by specific group processes. Additionally, research in the group processes area tends to be characterized by formal approaches to theory and by experimental methodology, and the course will attend to the role of theory and experiments in building knowledge on group processes.
Restriction: Permission of instructor.
Credit Only Granted for: SOCY681 or SOCY699G.
Formerly: SOCY699G.

SOCY683 Power, Status, and Leadership in Groups (3 Credits)
An overview of research on power, status, and leadership in group contexts. Power, or the ability to achieve one's will even against resistance from others, represents how leadership is often conceived in everyday thinking. The course will review the extensive literature on power in social groups and networks, one conclusion of which is that the power to control others often leads to difficulty in relationships. Leading with status (or influence) has the ability to mitigate some of the problems that are created by inequalities in power, and the course will also review the extensive body of theory and research on status and influence in groups. Organizations are political entities that require the use of power and influence to be effective. Thus, the course will survey theory and research on power, influence, and politics in organizational contexts, paying particular attention to how they are relevant to leadership.
Restriction: Permission of instructor.
Credit Only Granted for: SOCY683 or SOCY699N.
Formerly: SOCY699N.

SOCY699 Special Social Problems (1-16 Credits)

SOCY701 Issues in the Integration of Theory and Method (3 Credits)
The course is intended solely for advanced doctoral sociology students. The main objective of the course is to develop a dissertation proposal. Consequently, this course may only be taken during or after the semester in which the student completes the specialty (comprehensive) exams.
Prerequisite: Must have attained advanced status in the sociology Ph.D. program; or permission of instructor.
Credit Only Granted for: SOCY699Y or SOCY701.
Formerly: SOCY699Y.

SOCY709 Advanced Special Topics in Data Analysis (3 Credits)
An intensive examination of an area of interest in data analysis, including such topics as log linear analysis; discriminant function analysis; canonical correlation; factor analysis; analysis of qualitative data; content analysis; mathematical models.
Restriction: Permission of instructor.
Additional Information: May be repeated for credit with permission of instructor.

SOCY719 Advanced Special Topics in Social Psychology (3 Credits)
An intensive review of an area of current interest in the field, including such topics as social influence; interpersonal attraction; equity theory; the dramaturgical perspective; stress and coping; interpersonal conflict; the social psychology of large organizations.
Restriction: Permission of instructor.
Additional Information: May be repeated for credit with permission of instructor.

SOCY728 Advanced Special Topics in Meta-theory (3 Credits)
An intensive examination of an area of interest in sociological theory, including such topics as paradigm conflicts; philosophy of social science; value issues in sociological theory; formal theory.
Restriction: Permission of instructor.
Additional Information: May be repeated for credit with permission of instructor.

SOCY729 Advanced Special Topics in Substantive Theory (3 Credits)
An intensive examination of an area of interest in theory or a school of sociological theory, including such topics as ethnomethodology; structuralism; Marxism and critical theory; historical study of a major sociological theorist such as Marx, Weber, or Durkheim.
Restriction: Permission of instructor.
Additional Information: May be repeated for credit with permission of instructor.

SOCY739 Advanced Special Topics in Organizations and Occupations (3 Credits)
An intensive review of an area of current interest in the field, including such topics as managing organizational data sets; problems of industrial democracy; quality of work life; innovation and productivity.
Restriction: Permission of instructor.
Additional Information: May be repeated for credit with permission of instructor.

SOCY749 Advanced Special Topics in Demography (3 Credits)
An intensive review of an area of current interest in the field, including such topics as population policy; social and demographic issues in aging; migration; family demography.
Restriction: Permission of instructor.
Additional Information: May be repeated for credit with permission of instructor.

SOCY758 Advanced Special Topics in Sex Roles (3 Credits)
An intensive review of an area of current interest in the field, including such topics as labor force participation; comparative studies; sex roles and aging; gender socialization.
Restriction: Permission of instructor.
Additional Information: May be repeated for credit with permission of instructor.

SOCY759 Advanced Special Topics in Sociology of the Family (3 Credits)
An intensive review of an area of current interest in the field, such as alternative family life styles, cross-cultural and comparative family studies; victimization (sexual and physical abuse).
Restriction: Permission of instructor.
Additional Information: May be repeated for credit with permission of instructor.

SOCY769 Advanced Special Topics in Military Sociology (3 Credits)
An intensive review of an area of current interest in the field, including such topics as women in the military; conscription and national service; organizational change in the military; comparative studies of the military.
Restriction: Permission of instructor.
Additional Information: May be repeated for credit with permission of instructor.

SOCY789 Advanced Special Topics in Social Stratification (3 Credits)
An intensive examination of an area of interest in the field, including such topics as macrostratification; measurement of prestige; institutional variation in status attainment.
Restriction: Permission of instructor.

SOCY799 Master's Thesis Research (1-6 Credits)

SOCY819 Research Seminar in Social Psychology (1 Credit)
An advanced research seminar for students preparing to do research or take comprehensive examinations in social psychology.
Restriction: Permission of instructor.
Additional Information: May be repeated for credit with permission of instructor.

SOCY829 Research Seminar in Sociological Theory (1 Credit)
An advanced research seminar for students preparing to do research or take comprehensive examinations in sociological theory.
Restriction: Permission of instructor.
Additional Information: May be repeated for credit with permission of instructor.

SOCY839 Research Seminar in Organizations and Occupations (1 Credit)
An advanced research seminar for students preparing to do research or take comprehensive examinations in organizations or occupations.
Restriction: Permission of instructor.
Repeatable to: 6 credits.

SOCY849 Research Seminar in Demography (1 Credit)
An advanced research seminar for students preparing to do research or take comprehensive examinations in demography.
Restriction: Permission of instructor.
Repeatable to: 6 credits.

SOCY858 Research Seminar in Gender, Work and Family (1 Credit)
An advanced research seminar for students preparing to do research or take the specialty examination in Gender, Work and Family.
Restriction: Permission of instructor.
Repeatable to: 6 credits.

SOCY859 Research Seminar in Sociology of the Family (1 Credit)
An advanced research seminar for students preparing to do research or take comprehensive examinations in sociology of the family.
Restriction: Permission of instructor.
Repeatable to: 6 credits.

SOCY889 Research Seminar in Social Stratification (1 Credit)
An advanced research seminar for students preparing to do research or take comprehensive examinations in stratification.
Restriction: Permission of instructor.
Repeatable to: 6 credits.

SOCY898 Pre-Candidacy Research (1-8 Credits)

SOCY899 Doctoral Dissertation Research (1-8 Credits)

SPAN - Spanish

SPAN401 Advanced Composition I (3 Credits)
Compositions and essays with emphasis on stylistics, idiomatic and syntactic structures. Organization and writing of research papers.
Prerequisite: SPAN302; or permission of ARHU-School of Languages, Literatures, and Cultures department.

SPAN402 Advanced Composition II (3 Credits)
Compositions and essays with emphasis on stylistics, idiomatic and syntactic structures. Organization and writing of research papers.
Prerequisite: SPAN401; or permission of ARHU-School of Languages, Literatures, and Cultures department.

SPAN404 The Bright Middle Ages (3 Credits)
The period that precedes the Renaissance has been traditionally labeled as the "dark" Middle Ages and it is common to associate an evil, brutality and barbarian life style with the time span comprised of between the 5th and the 15th centuries. This undergraduate seminar does not intend to embellish the truth or to minimize the hardships of life and death at the time of the Crusades. In fact, an objective timeline of historical events that marked that period as middle will be provided, and the central question to be addressed in this class is, "Middle of what"? As we try to answer it, we will be able to examine many "modern" aspects of the Middle Ages. Some of them have been highlighted since the beginning of the 20th century and justify a view of the Middle Ages as a bright and "modern" period in which, while overcoming despicable difficulties and a lack of facilities, the most precious treasures of our times were intellectually conceived, manufactured, built, and written. Taught in Spanish.
Prerequisite: SPAN331, SPAN332, SPAN333, SPAN361, SPAN362, or SPAN363; or permission of instructor.
Credit Only Granted for: SPAN404, or SPAN408I.
Formerly: SPAN408I.

SPAN405 North American Neomedievalism: the U.S. East Coast and 16th-Century Spain (3 Credits)
The fall of the Roman Empire certainly did not affect North America, but the European Middle Ages created several patterns of expansion that, with considerable transformations, are present in North America and all over the world. Through the study of Neomedievalism, students will be able to better understand today's national and international relations. We will read scholarship that helps us understand that it is not an accident that we have replicas of medieval villas and that we are increasingly interested in developing games and producing movies that replicate medieval life. We will also study why the failure and success of social and economic systems of the past have influenced modern civilizations and why the loaded concepts of "barbarian" and "foreign" have not disappeared. Taught in Spanish.
Prerequisite: SPAN331, SPAN332, SPAN333, SPAN361, SPAN362, or SPAN363; or permission of instructor.
Credit Only Granted for: SPAN405 or SPAN408C.
Formerly: SPAN408C.

SPAN406 Don Juan Manuel's Fictional and Historical Prose (3 Credits)
Dedicated to the literary production of an important author. Don Juan Manuel. By examining the interaction among writing, reading and the oral acquisition of knowledge in his works, special attention will be given to how the border between fact and fiction is constructed in the Middle Ages.
Prerequisite: SPAN333, SPAN361, SPAN331, SPAN332, SPAN362, or SPAN363.

SPAN407 Early Modern US and Early Modern Spain: A Common History (3 Credits)
The impact of Spanish early modern literature, cartography and architecture in the US Atlantic Coast (Labrador Peninsula to Florida). The class will start with readings that will provide a general overview of the Spanish presence in the US and its role in the early history of this country. We will continue reading about the voyages of exploration to the US East Coast of 1521-1526, which were sponsored by a Spaniard, Lucas Vazquez de Ayllon. These voyages subsequently resulted in a territory named "Tierras de Ayllon" (from Florida to the Chesapeake Bay). These Lands of Ayllon were located on the settlement of Chicora and the Missions of Ajacan and San Miguel de Gualdape. We will focus on the history and the geographical location of these Spanish establishments; they paralleled geographically and anteceded chronologically those of the British colony at Roanoke (1585) and the eventual establishment of Jamestown (1607). Taught in Spanish.
Prerequisite: SPAN331, SPAN332, SPAN333, SPAN361, SPAN362, or SPAN363; or permission of instructor.

SPAN408 Special Topics in Iberian and Latin American Studies (3 Credits)
Special topics in (a) the literature and film of Spain, Spanish-speaking Latin America, and U.S. Latina/o communities; (b) Spanish linguistics; and (c) Spanish, Latin American, and U.S. Latino cultural studies. Each topic will be announced when the course is offered.
Prerequisite: SPAN333, SPAN361, SPAN331, SPAN332, SPAN362, or SPAN363.

SPAN410 Libro de Buen Amor: Literary Matchmaking, Theory, and Praxis (3 Credits)
Literary traditions in the Libro de buen amor. Taught in Spanish
Prerequisite: One of the following SPAN331, SPAN332, SPAN333, SPAN361, SPAN362, or SPAN363; or permission of instructor.
Credit Only Granted for: SPAN410 or SPAN413.
Formerly: SPAN413.

SPAN412 Women in the Middle Ages: Myths and Daily Life (3 Credits)
Explores the role of women during the Middle Ages and analyzes the active participation of women in a society in which men's occupation was warfare. Also explores "feminine voices" and female representations in the literature of the times.
Prerequisite: SPAN333, SPAN361, SPAN331, SPAN332, SPAN362, or SPAN363.

SPAN418 Hispanic Literature in Translation (3 Credits)
Repeatable to: 6 credits if content differs.

SPAN420 Spanish and Spanish-Speaking Communities in the US (3 Credits)
Lays the foundations for the historical, linguistic, cultural, sociological, and political study of Spanish in the United States (US). The main goal of the course is to develop critical awareness about the relationship between language, individuals, and society within the diverse Spanish-speaking communities of the US. To this end, the course will analyze issues concerning, first, the historical and dialectal characteristics of the Spanish language in different regions of this country; second, the acquisition of Spanish as a minority language and in contact with both English and a large number of Spanish dialects; and third, the space that Spanish occupies in US public life now and in the future. The design of activities, assignments, and assessment procedures is based on promoting individual and collective awareness about crucial topics related to the present and the future of Spanish as one of the national languages of the US.
Prerequisite: SPAN325, SPAN425, or permission of instructor.
Credit Only Granted for: SPAN478A or SPAN420.
Formerly: SPAN478A.

SPAN422 Intercultural Communication and Negotiation (3 Credits)
Focuses on the relationship of language and culture of those operating in world markets. Particular attention will be given to intercultural communication, linguistic systems, culture specific perceptions of, and negotiation with, the Spanish-speaking world. Taught in Spanish.
Prerequisite: SPAN370 OR SPAN371 OR SPAN373 OR SPAN 374.
Restriction: Junior standing or higher.

SPAN425 Hispanic Linguistics II: Structures of Spanish (3 Credits)
This course begins with an introduction to general concepts in linguistics, from language function and the brain to communication, culture, and thought, and their relation to other disciplines in the social sciences. The main purpose of this course is to provide an overview of Hispanic linguistics through multiple perspectives, while exploring the areas of Spanish morphology, syntax, and semantics. This course will also focus on the structural tendencies of Spanish through a variety of practical activities. Taught in Spanish.
Prerequisite: SPAN303; and SPAN311 or SPAN316 or SPAN325.

SPAN426 Hispanic Linguistics III: Language in Use (3 Credits)
Designed for students without previous experience in Linguistics. Focus on language variation and use, linguistic change, and bilingualism. Taught in Spanish.
Prerequisite: SPAN303; and SPAN311 or SPAN316 or SPAN325. Also offered as: SPAN626.
Credit Only Granted for: SPAN426 or SPAN626.

SPAN427 Visions and Fictions from Spain (3 Credits)
Overview of Spanish Cinema from the end of the 19th century through present day Spain. Exploration of the production of literary and cinematic texts in their sociohistorical, political, religious and cultural contexts. Taught in Spanish.
Prerequisite: SPAN331, SPAN332, or SPAN333; or students who have taken courses with comparable content may contact the department; or permission of ARHU-Spanish & Portuguese Languages & Literatures department.
Cross-listed with: CINE427.
Credit Only Granted for: CINE427, FILM427 or SPAN427.
Formerly: FILM427.

SPAN431 Mexican Women Writers (3 Credits)
Focuses on Mexican women writers from the colonial period to the present. It consists of various types of texts, including poetry, short story, essay, and novel. Its principal themes include the relations among experience, knowledge, and expression; the presence or absence of women in literary histories, including Wikipedia pages; feminism; and the opportunities and challenges presented by the category of women writers. Taught in Spanish.
Prerequisite: SPAN331, SPAN332, SPAN333, SPAN361, SPAN362, or SPAN363; or permission of instructor.

SPAN432 Colonial Latin American Literature (3 Credits)
Examines the key themes, writers, literary movements, and cultural debates of the colonial period.
Prerequisite: SPAN333, SPAN361, SPAN331, SPAN332, SPAN362, or SPAN363.

SPAN433 Women and Culture in Colonial Latin America (3 Credits)
Considers questions of women and historical production, women writers in colonial times, and contemporary literary interpretations of colonial realities. Debates the continued legacy of female archetypes from the colonial period to the present, and epistemological questions regarding the production of knowledge.
Prerequisite: SPAN333, SPAN361, SPAN331, SPAN332, SPAN362, or SPAN363.

SPAN434 The Usable Past: Reflecting on Archives in Contemporary Fictions and Films from the Southern Cone (3 Credits)
Che Guevara on a t-shirt, Eva Peron in a Broadway musical, Bolivar as trans on a postcard, Gabriela Mistral on a peso bill, Pablo Neruda as a postman's friend, Frida Kahlo as a feminist icon, Artigas in a blues band ... The list goes on. Nevertheless, what all these cultural appropriations have in common is that the present has used the past to inscribe a functional narrative for that time. This course will not ask if we can know past events as they really happened, but rather it will explore how contemporary fictions, films, and visual art from the Southern Cone construct usable cultural archives for their present. Also, this seminar traces the ways in which contemporary authors, filmmakers, and visual artists reflect on the past in order to critically read their present. Concentrating on the past as both the subject of fiction and as a force for inscribing fiction, this seminar inscribes an approach to time that moves away from a linearity.
Prerequisite: SPAN331, SPAN332, SPAN333, SPAN361, SPAN362, or SPAN363; or permission of instructor.
Credit Only Granted for: SPAN434 or SPAN408F.
Formerly: SPAN408F.
Additional Information: Taught in Spanish.

SPAN435 Ecuador: Andean Spaces-Traversing the Colonial City and the Natural World (3 Credits)
Introduces students to the history and cultures of Ecuador from the colonial period to the beginning of the 19th century. By studying the socio-spatial configuration of the colonial city as exemplified by Quito, students will be immersed in the art, architecture, and other rich cultural legacies of Ecuador. Quito, a World Heritage site, offers students visually stunning churches, monasteries, colonial squares, a famed tradition of Baroque painting and sculptures, and vibrant indigenous and mestizo communities. As a contrast, students will explore also travel narratives that represent the natural Andean world while visiting Quito's surrounding areas. This course will interrogate the European influence on urban design and representations of the landscape of the Americas. Understanding this colonial past enhances the understanding of the modern history of the Andean region and Latin America as a whole. The students will gain a full appreciation of the European and Indigenous living heritage that composes the region today. Taught in English.
Cross-listed with: ARTH472.
Credit Only Granted for: SPAN435, SPAN448E, ARTH472 or ARTH369E.
Formerly: SPAN448E and ARTH369E.

SPAN436 Representations of Childhood and Youth in Latin American Literature and Film (3 Credits)
Focuses on the representation of childhood and youth in films and works of fiction from various regions of the Spanish-speaking Americas, including Mexico, the Caribbean, the US, and Peru. We are going to read various short stories and novels, and watch two films, all of which develop in different ways the topics of childhood and youth. Taught in Spanish.
Prerequisite: SPAN331, SPAN332, SPAN333, SPAN361, SPAN362, or SPAN363; or permission of instructor.

SPAN437 Love, Science, Religion and the Pursuit of Criollo Independence in 18th-Century Mexico (3 Credits)
Explores the 18th century from the periphery of traditionally studied centers of Enlightenment. By focusing on pre-independence Mexico, we will study the emergence of alternative scientific and religious discourses in an American context that leads to social and political changes at the onset of the 19th century. Students will watch the Mexican telenovela "Alborada" (2005-6), which fictionally explores many of the topics that are relevant for the course. Students will also read a variety of materials on the following subtopics: imperial designs, cultural production, inquisitional realities, medical discourse, individual and political rights, criollo consciousness, etc. All writing and discussion will be in Spanish. Taught in Spanish.
Prerequisite: SPAN331, SPAN332, SPAN333, SPAN361, SPAN362, or SPAN363; or permission of instructor.

SPAN438 Special Topics in Colonial Latin America (3 Credits)
The conquest and colonization of the New World produced a textual corpus of invaluable importance for the foundation of Spanish American literary tradition. Special topics (themes, authors, debates, etc.) relevant to the Colonial period will be addressed.
Prerequisite: SPAN333, SPAN361, SPAN331, SPAN332, SPAN362, or SPAN363.
Repeatable to: 9 credits if content differs.

SPAN440 Speaking Up/Out: Women Writers and Feminist Social Movements in Contemporary Latin America (3 Credits)
This seminar will explore how feminist subversion of naturalized power relationships has become a social force that is reshaping Latin American culture in the last several decades. Also, we will study how contemporary cultural artifacts contest value systems while rejecting entrenched hierarchies and norms. By reading contemporary women writers and by working on contemporary feminist social movements, this course will explore what the anthropologist Rita Segato has defined as "the war against women." Taught in Spanish.
Prerequisite: SPAN331, SPAN332, SPAN333, SPAN361, SPAN362, or SPAN363; or permission of instructor.

SPAN442 Detective Fiction in Latin America (3 Credits)
Focuses on Latin American detective fiction, including novels and short stories, whodunits and thrillers. Detective fiction's origins are primarily from outside of Latin America. Therefore the course will also include important texts from other traditions, including the US, English, and French. Taught in Spanish.
Prerequisite: SPAN303; and SPAN311 or SPAN316; and one from (SPAN331, SPAN332, SPAN333, SPAN361, SPAN362, or SPAN363) or permission of instructor.

SPAN448 Special Topics in Latin American Civilization (3 Credits)
Intensive independent study of a selected topic related to Latin American civilization.
Prerequisite: SPAN333, SPAN361, SPAN331, SPAN332, SPAN362, or SPAN363.
Repeatable to: 6 credits if content differs.

SPAN449 Special Topics in Spanish Civilization (3 Credits)
An intensive study of a selected topic related to Spanish civilization.
Prerequisite: SPAN333, SPAN361, SPAN331, SPAN332, SPAN362, or SPAN363.
Repeatable to: 6 credits if content differs.

SPAN450 The Hispanic Caribbean: What is a Beach? (3 Credits)
Explores the Hispanic Caribbean as "island spaces" of multiple migrations and cultural identities, as sites of colonial experiences and post-colonial debates.
Prerequisite: SPAN333, SPAN361, SPAN331, SPAN332, SPAN362, or SPAN363.

SPAN451 Paradise Lost: Cuban Cinematic Culture (3 Credits)
Explores the cinematic journey of the Cuban revolution from socialist utopia to bitter disillusionment. Taking as a point of departure the national postulates of an "Imperfect Cinema" and the different theorizations of "New Latin American cinema," the course will concentrate on the emergence and development of Cuban cinematic culture that has taken place during the revolution. Our objective is to explore how art and politics collide to reveal contested visions of a social process. Visual materials will include films and documentaries. Readings will include selections from historiographic and literary works, as well as contemporary critical studies.
Prerequisite: One course from SPAN331, SPAN332, SPAN333, SPAN361, SPAN362, or SPAN363; or permission of instructor.
Credit Only Granted for: SPAN451, CINE429W or SPAN408P.
Formerly: SPAN408P.

SPAN452 Reflecting on Neoliberalism and Contemporary Southern Cone Culture (3 Credits)
An exploration of how neoliberalism and its market-driven economy have shaped Latin American culture of the last decades. In particular, we will explore how contemporary cultural artifacts are inscribed into a value system that quantifies the unquantifiable, that is to say, a system that only values a book or an artist based on sales. In this class, we will work with a variety of cultural artifacts from Argentina, Chile, and Uruguay–films, chronicles, music, newspapers, cartoons, literature, and documentaries--to map how culture and markets intersect. Taught in Spanish.
Prerequisite: SPAN331, SPAN332, SPAN333, SPAN361, SPAN362, or SPAN363; or permission of instructor.

SPAN453 Seeking Adventure and Glory: Don Quixote (3 Credits)
Widely acknowledged as the first modern novel, Don Quixote tells the story of a middle-aged Spanish gentleman who, obsessed with the chivalrous ideals found in romantic tales, decides to take up his lance and sword to defend the helpless and destroy the wicked. Seated upon his horse Rocinante and accompanied by his loyal squire Sancho Panza, Don Quixote sets out on the roads of Spain seeking adventure and glory. The course will consist of a close reading of Don Quixote. We will analyze and comment on the novel at the literal and historical levels, as well as in its symbolic and widely anthropological dimensions. We will also establish a dialogue between Don Quixote and the narrative and philosophical traditions of Europe, United States and Latin America. Taught in Spanish.
Prerequisite: One of the following: SPAN331, SPAN332, SPAN333, SPAN361, SPAN362, or SPAN363; or permission of instructor.
Credit Only Granted for: SPAN430 or SPAN453.
Formerly: SPAN430.

SPAN456 Construction of Gender and Sexuality in the Spanish Realist-Naturalist Novel (3 Credits)
Examines 19th-century Spanish normative notions regarding gender expression and identities as well as men's and women's sexualities in the Realist and Naturalist novel. Also, we will discuss representations of men and women whose behavior ran afoul of a heteronormative system that valued domestic privacy as a space of honor and virtuous masculinity and femininity. Taught in Spanish.
Prerequisite: One of the following: SPAN331, SPAN332, SPAN333, SPAN361, SPAN362, or SPAN363; or permission of instructor.
Recommended: SPAN333.

SPAN457 Comedy, Foppery, and Foreignness in Eighteenth-Century Spain (3 Credits)
We will explore the comical and satirical elements in 18th-century Spanish literary works, situating them within the social and historical context of the aesthetic tastes of the Spanish reading public and how those tastes impacted the production of literature and other cultural artifacts. Taught in Spanish.
Prerequisite: One of the following: SPAN331, SPAN332, SPAN333, SPAN361, SPAN362, or SPAN363; or permission of instructor.
Recommended: SPAN333.

SPAN460 The Sublime and the Grotesque in Spanish Romantic Plays and the Visual Arts (3 Credits)
An exploration of the notions of the sublime and the grotesque in theatrical works as well as in the visual arts of the Romantic movement in Spain. Taught in Spanish.
Prerequisite: SPAN331, SPAN332, SPAN333, SPAN361, SPAN362, or SPAN363; or permission of instructor.

SPAN461 Queer Spain (3 Credits)
Explores discursive representations of Spaniards who were judged as non-normative by their society during the modern and contemporary period. Putting a critical lens to various cultural artifacts (visual arts, fiction, film, and journalism), we will interrogate what it means to be "(ab)normal" in terms of gender expression, erotic desire, sexuality, and anatomical sex in Spain at critical junctures in modern history. Taught in Spanish.
Prerequisite: One of the following: SPAN331, SPAN332, SPAN333, SPAN361, SPAN362 or SPAN363; or permission of instructor.
Recommended: SPAN333.

SPAN462 Twentieth Century Drama (3 Credits)
Significant plays of the twentieth century.
Prerequisite: SPAN333, SPAN361, SPAN331, SPAN332, SPAN362, or SPAN363.

SPAN463 Cultural Artifacts of Contemporary Spanish Crises from 1898 to the COVID Pandemic (3 Credits)
An overview of Spain from the end of the 19th century through the present day and studies some of its main crises. The course explores the production of literary, cultural, and cinematic texts in their sociohistorical, political, religious and cultural contexts and development. This interdisciplinary course covers topics such as political, historical, religious, racial, ethnic, gendered/sexual, cultural, and ethno-geographical, literary and cinematic diversities and differences in Contemporary Spain. Taught in Spanish.
Prerequisite: SPAN331, SPAN332, SPAN333, SPAN361, SPAN362, or SPAN363; or permission of instructor.

SPAN464 Contemporary Spanish Poetry (3 Credits)
Spanish poetry from the generation of 1927 to the present.
Prerequisite: SPAN333, SPAN361, SPAN331, SPAN332, SPAN362, or SPAN363.

SPAN465 Spanish Exiles and Totalitarianisms (3 Credits)
An overview of the cultural and literary production regarding the Spanish Civil War (1936-1939) and its aftermath in the context of political exile from the early 20th century through present-day Spain. The course explores the production of literary texts in their sociohistorical, political, and cultural contexts and development as a reflection of that crisis in the conscience of present-day Spain. This interdisciplinary course covers topics such as political, historical, religious, racial, ethnic, gendered/sexual, cultural, and ethno-geographical diversities and differences concerning the Spanish Civil War and its aftermath. Taught in Spanish.
Prerequisite: SPAN331, SPAN332, SPAN333, SPAN361, SPAN362, or SPAN363; or permission of instructor.
Recommended: SPAN333.

SPAN466 The Contemporary Spanish Novel (3 Credits)
The novel and the short story from 1940 to the present.
Prerequisite: SPAN333, SPAN361, SPAN331, SPAN332, SPAN362, or SPAN363.

SPAN467 Visions and Fictions from Spain (3 Credits)
Overview of Spanish cinema from the end of the 19th century through present day Spain. Exploration of the production of literary and cinematic texts in their social, historical, political, religious, and cultural contexts.
Prerequisite: One course from SPAN331, SPAN332, SPAN333, SPAN361, SPAN362 or SPAN363; or permission of instructor.
Recommended: SPAN333.
Cross-listed with: CINE467.
Credit Only Granted for: CINE427, CINE467, FILM427, SPAN427, or SPAN467.
Formerly: FILM427, CINE427, and SPAN427.

SPAN468 Modernism and Post-Modernism in Spain and Spanish-America (3 Credits)
A study of the most important works and authors of both movements in Spain and Spanish-America.
Prerequisite: SPAN333, SPAN361, SPAN331, SPAN332, SPAN362, or SPAN363.
Repeatable to: 9 credits if content differs.

SPAN469 Study Abroad Special Topics IV (1-6 Credits)
Special topics course taken as part of an approved study abroad program.
Repeatable to: 15 credits if content differs.

SPAN471 United States Latina Fiction (3 Credits)
An introduction to United States latina fiction through the study of short stories, novels, poetry, etc. It explores strategies of representation by women of color.
Prerequisite: SPAN333, SPAN361, SPAN331, SPAN332, SPAN362, or SPAN363.

SPAN472 Latina/o Communities and Language Struggles (3 Credits)
Explores the history of Latina/o communities and their language "choices," negotiations, and struggles in the United States, starting with the Spanish conquest of North America through the 21st century. We examine the lasting impact of the War of 1848 by which the U.S. colonized the southwest and consider how the Spanish-American War of 1898 imposed U.S. rule in the Hispanophone Caribbean. In this context of struggle, we examine how language repression and expression gave voice to the Latinx civil rights movements in the 1960s and 1970s as well as current immigration and education movements. Texts include Spanish cronicas, U.S. political treaties, the Hispanic press, manifestos, novels, poetry, spoken word, film, music, among others. Course format consists of lectures, discussions, group work, short essays, presentations, and examinations. Students should expect to participate in a community engagement project. Taught in Spanish and discussions in Spanglish.
Prerequisite: SPAN331, SPAN332, SPAN333, SPAN361, SPAN362, or SPAN363; or permission of the instructor.
Credit Only Granted for: SPAN408T or SPAN472.
Formerly: SPAN408T.

SPAN473 U.S. Latino Performance (3 Credits)
An introduction to United States Latino Performance texts by Chicano, Nuyorican, Cuban-American, Dominican, Central-American and others.
Prerequisite: SPAN333, SPAN361, SPAN331, SPAN332, SPAN362, or SPAN363.

SPAN474 Central American Literatures, Cultures, and Histories (3 Credits)
An overview of Central American history and cultural production, focusing primarily but not exclusively on literary texts.
Prerequisite: SPAN333, SPAN361, SPAN331, SPAN332, SPAN362, or SPAN363.

SPAN475 Central America: 21st-Century Literature & Culture (3 Credits)
Explores the discursive construction of Central America in the 21st century, from banana republic to northern triangle. While we study issues of violence, crime, feminicide, impunity, corruption, migration, human and drug trafficking, and climate change, we will moreover focus on people's struggles for equality, human rights, environmental justice, food security, healthcare, education, and employment in the region. We seek to understand the root cause of local and global conditions in Central America as well as the creative and resilient ways that Central Americans respond to them. Texts include novels, short stories, cronicas, news, films, photography, and other re/sources. Course format consists of lectures, discussions, group work, short essays, presentations, and examinations. Students should expect to participate in a community engagement project. Taught in Spanish and discussions in Spanglish.
Prerequisite: SPAN331, SPAN332, SPAN333, SPAN361, SPAN362, or SPAN363; or permission of instructor.
Credit Only Granted for: SPAN408L or SPAN475.
Formerly: SPAN408L.

SPAN476 Central Americans in the DMV (3 Credits)
Explores the history, migration, and cultural representation of Central Americans in the DMV (DC, Maryland, and Virginia) in the larger context of transnational relations between Central America and the United States. We ask how and why the DMV is home to one of the largest concentrations of Central Americans, especially Salvadorans, in the nation, as well as examine the diaspora as a transnational process. We study plays, short stories, poetry, spoken word/ performances, films, music, photography, zines, social media, and other interdisciplinary re/sources, and engage one-on-one with local and international artists, activists, and community organizations. Course format consists of lectures, discussions, group work, short essays, presentations, and examinations. Students should expect to participate in a community engagement project. Taught in Spanish and discussions in Spanglish.
Prerequisite: SPAN331, SPAN332, SPAN333, SPAN361, SPAN362, or SPAN363; or permission of instructor.
Credit Only Granted for: SPAN408W or SPAN476.
Formerly: SPAN408W.

SPAN477 Between Worlds: Central American Diasporas (3 Credits)
Examines Central America as a locus of diasporas, from its geological formation as an isthmus to the current movement of peoples across El Salvador, Guatemala, Nicaragua, Honduras, Costa Rica, Panama, Belize, and beyond. It offers a broadscale view of Central American societies, histories, (geo)politics, social and revolutionary movements, and cultural and literary production, and situates diasporic literature in relation to migration, war, genocide, violence, transnationalism, globalization, among others. Because the Washington, D.C. Metropolitan Area is a significant site of the Central American diasporas, we will explore our particular location and engage with local diasporic communities. Course format consists of lectures, discussions, group work, short essays, presentations, and examinations. Students should expect to participate in a community engagement project. Taught in Spanish and discussions in Spanglish.
Prerequisite: SPAN331, SPAN332, SPAN333, SPAN361, SPAN362, or SPAN363; or permission of instructor.
Credit Only Granted for: SPAN408R or SPAN477.
Formerly: SPAN408R.

SPAN478 Special Topics in United States Latino Cultures (3 Credits)
Explores special topics in US Latino Cultures, ranging from Chicano, Nuyorican, Cuban-American, Dominican, Central-American and other border cultural identities.
Prerequisite: SPAN333, SPAN361, SPAN331, SPAN332, SPAN362, or SPAN363.
Repeatable to: 9 credits if content differs.

SPAN479 Honors Thesis (3-6 Credits)
Researching and writing an honors thesis under the direction of a professor.
Restriction: Must be in Spanish and Portuguese Honors.
Repeatable to: 6 credits if content differs.

SPAN480 Spanish for Business II (3 Credits)
Business Spanish terminology, vocabulary and practice. Emphasis on everyday spoken and written Spanish. Readings and discussions of international topics. Cross-cultural considerations relative to international business operations, including exporting and banking. Taught in Spanish.
Prerequisite: Must have completed SPAN370.
Restriction: Sophomore standing or higher.
Credit Only Granted for: SPAN470 or SPAN480.

SPAN495 Honors Reading (3 Credits)
Supervised reading.
Prerequisite: Must be in Spanish and Portuguese Honors; or permission of ARHU-School of Languages, Literatures, and Cultures department.

SPAN605 Teaching Spanish I (1 Credit)
Methods and materials for teaching Spanish in higher education.
Prerequisite: Permission of ARHU-School of Languages, Literatures, and Cultures department.
Restriction: Must be a Spanish teaching assistant.

SPAN608 Medieval Spanish Literature (3 Credits)
Specific authors, genres, and literary periods studied in depth.

SPAN609 Medieval Spanish Literature (3 Credits)
Specific authors, genres, and literary periods studied in depth.

SPAN611 Current Trends in Hispanic Applied Linguistics (3 Credits)
Introduction to current trends in Hispanic Applied Linguistics, emphasizing learning and teaching in Spanish-language contexts.
Restriction: Permission of ARHU-Spanish & Portuguese Languages & Literatures department.

SPAN613 Bilingualism and Biculturalism in Spanish-Speaking Communities (3 Credits)
Exploration of Latino bilingual and bicultural communities, Spanglish, language variants, U.S. Latina/o literary and cultural production. Spanish highly recommended.
Restriction: Permission of ARHU-Spanish & Portuguese Languages & Literatures department.

SPAN618 Poetry of the Golden Age (3 Credits)
Analyses and studies in depth of specific works of specific poets in the sixteenth and seventeenth centuries.

SPAN619 Poetry of the Golden Age (3 Credits)
Analyses and studies in depth of specific works of specific poets in the sixteenth and seventeenth centuries.

SPAN622 Intercultural Communication and Negotiation (3 Credits)
Focuses on the relationship of language and culture and the negotiation of meaning within different speech communities. Students will learn concepts to describe how language is used in real communicative contexts and apply these to understand and use Spanish appropriately in different professional situations and environments. The course includes a research component. Taught in Spanish.
Jointly offered with: SPAN422.
Credit Only Granted for: SPAN422 or SPAN622.

SPAN625 Introduction to Hispanic Linguistics I:Basic Concepts (3 Credits)
Introduction to basic terms and definition in Hispanic Linguistics. Fundamental aspects of phonology, morphology, syntax, semantics, sociolinguistics, and pragmatics.

SPAN626 Hispanic Linguistics II: Language in Use (3 Credits)
This course will focus on issues related to language variation and use with a more in-depth analysis of the semantics, pragmatics, and sociolinguistics of Spanish. Students will be introduced to current research in the fields of dialectology, bilingualism and language policy, and the social aspects of language change. This course will include an analysis of current research as it relates to the field of linguistics and other social sciences.
Prerequisite: SPAN301; or permission of ARHU-School of Languages, Literatures, and Cultures department. Jointly offered with SPAN426.
Credit Only Granted for: SPAN426 or SPAN626.

SPAN628 Seminar: the Golden Age in Spanish Literature (3 Credits)

SPAN629 Seminar: the Golden Age in Spanish Literature (3 Credits)
Specific authors, genres, literary movements and literary periods of the sixteenth and seventeenth centuries studied in depth.

SPAN698 Masterpieces of Hispanic Literatures (3 Credits)
Study of masterpieces of the hispanic literatures, topics, areas of literature and works to vary.
Repeatable to: 6 credits if content differs.

SPAN699 Independent Study in Spanish (1-3 Credits)
This course is designed to provide graduate students an opportunity to pursue independent study under the supervision of a member of the department.
Repeatable to: 3 credits.

SPAN708 The Eighteenth Century (3 Credits)
Specific authors, genres, and literary movements studied in depth.

SPAN718 The Nineteenth Century (3 Credits)
Specific authors, genres, and literary movements studied in depth.

SPAN719 The Nineteenth Century (3 Credits)
Specific authors, genres, and literary movements studied in depth.

SPAN728 The Twentieth Century (3 Credits)
Specific authors, genres and literary movements studied in depth.

SPAN729 The Twentieth Century (3 Credits)
Specific authors, genres and literary movements studied in depth.

SPAN738 The Drama of the Twentieth Century (3 Credits)
Specific authors and movements studied in depth.

SPAN788 Seminar Series in Spanish and Latin American Languages, Literatures, and Cultures (1-2 Credits)
Topics to be announced when course is offered.
Prerequisite: Permission of ARHU-School of Languages, Literatures, and Cultures department.
Repeatable to: 8 credits if content differs.

SPAN798 Open Seminar (3 Credits)
Repeatable to: 40 credits.

SPAN799 Master's Thesis Research (1-6 Credits)

SPAN808 Colonial Spanish-American Literature (3 Credits)
Didactic and narrative prose and epic, dramatic and lyric poetry; principal works and authors.

SPAN809 Colonial Spanish American Literature (3 Credits)
Didactic and narrative prose; dramatic and lyric poetry.

SPAN818 National Spanish-American Literature (3 Credits)
Characteristics of the national literatures. Romantic and Costumbrista literature. Gauchismo and Indigenismo. Principal works and authors.

SPAN819 National Spanish American Literature (3 Credits)
Characteristics of the national literatures. Romantic and Costumbrista literature. Gauchismo and Indigenismo. Principal works and authors.

SPAN828 Hispanic Poetry of the Nineteenth and Twentieth Centuries (3 Credits)
Specific authors, genres and literary movements studied in depth.

SPAN829 Hispanic Poetry of the Nineteenth and Twentieth Centuries (3 Credits)
Specific authors, genres and literary movements studied in depth.

SPAN898 Pre-Candidacy Research (1-8 Credits)

SPAN899 Doctoral Dissertation Research (1-8 Credits)

SPHL - Public Health

SPHL478 Special Topics in Public Health (1-4 Credits)
Special topics in the field of public health.
Repeatable to: 8 credits if content differs.

SPHL488 Children's Health and Development Clinic (1-4 Credits)
An opportunity to acquire training and experience in a therapeutically oriented physical education-recreation program for children referred by various education, special education, medical or psychiatric groups.
Prerequisite: Permission of SPHL-School of Public Health.

SPHL498 Special Topics in Public Health (3 Credits)
Topical and interdisciplinary courses of interest to upper level undergraduate students in the field of Public Health not currently covered by the program.
Restriction: Junior standing or higher.
Repeatable to: 9 credits if content differs.
Credit Only Granted for: SPHL498 or SPHL698 of same suffix.

SPHL600 Foundations of Public Health (3 Credits)
An overview of the goals, functions, and methods of public health. After an introduction to the core concepts and tools used in public health research and practice, applications of these methodologies are considered in the context of current controversies/problems in public health. Students work together to develop strategies for prevention and control that taken into consideration different points of view, outside research, and impacts on individuals and communities.
Restriction: Must be a graduate student within the School of Public Health.
Credit Only Granted for: SPHL100, PHSC300 or SPHL600.

SPHL601 Core Concepts in Public Health (1 Credit)
Introduces students to the history, functions, systems, policies, and models of public health practice in the United States and globally. The course offers seminars, interactive activities, and assessments aimed at establishing a baseline understanding of public health necessary for higher level and integrative learning in subsequent public health courses.
Restriction: Must be a Master's of Public Health (MPH) or Master's of Health Administration (MHA) student within the School of Public Health.

SPHL602 Foundations of Epidemiology and Biostatistics (4 Credits)
An introduction to conceptual and practical tools from epidemiology and biostatistics that are necessary for the study of public health problems. Students learn epidemiologic concepts and methods, and basic statistical concepts and procedures used in public health research through applications, hands-on experience, and interpretations of statistical findings.
Recommended: Recommend SPHL603 as a co-requisite course.
Restriction: Must be a graduate student within the School of Public Health.
Credit Only Granted for: SPHL602 or EPIB610 and EPIB650.

SPHL603 Public Health Data Laboratory (1 Credit)
An introduction to the statistical software necessary to implement the epidemiology and biostatistics concepts covered in the course EPIB 602, Foundations of Epidemiology and Biostatistics through hands-on exercises.
Corequisite: SPHL602.
Restriction: Must be a graduate student within the School of Public Health.

SPHL610 Program and Policy Planning, Implementation, and Evaluation (5 Credits)
This second course in the MPH/MHA integrated core sequence will prepare students to engage in the important tasks of assessing population and patient needs, implementing and evaluating culturally appropriate public health programs, policies, and interventions, and pursuing appropriate resources to support activities through the policy process and via effective use of power in the face of competing interests. The course will be a mix of individual and team-based assignments based upon an existing or newly identified problem, in addition to case studies, interactive simulations, and applied writing assignments.
Recommended: Completion of SPHL 601, 602, and 603 with a grade of B- or better in each. Note that completion of SPHL 601, 602, and 603 with a B- or better is a graduation requirement for the MPH/MHA degrees; and concurrent enrollment in SPHL 611.
Restriction: Must be in a graduate student in SPHL-School of Public Health.

SPHL611 Public Health Ethics (1 Credit)
Overview and discussion of ethical issues that face public health practitioners.
Prerequisite: Must have completed SPHL601; or permission of instructor.
Restriction: Must be a graduate student in the School of Public Health.
Credit Only Granted for: EPIB641, KNES689Y, or SPHL611..
Formerly: EPIB641, KNES689Y.

SPHL612 Research Ethics (1 Credit)
Overview and discussion of ethical issues that face public health researchers.
Restriction: Must be a graduate student in the School of Public Health.
Credit Only Granted for: EPIB641, KNES689Y or SPHL612.
Formerly: EPIB641, KNES689Y.

SPHL615 Crises of Aging: Time, Retirement and Widowhood (3 Credits)
A cross-disciplinary and multidisciplinary investigation of phenomena which comprise a significant portion of the issues confronting an older adult's life: (1) introduction to multiple processes of adulthood and aging; (2) the concepts and meaning of time; (3) pre-retirement and retirement adjustments; and (4) loss and widowhood.
Credit Only Granted for: HLHP615 or SPHL615.
Formerly: HLHP615.

SPHL620 Leadership, Teams, and Coalitions: Policy to Advocacy (2 Credits)
Students learn team building, leadership, and advocacy skills through the development and presentation of a policy brief on an urgent public health issue. The class will use a combination of brief lectures, discussions, and planned activities on how to develop a policy briefing. Students will have an inter-professional experience during which they will discuss possible approaches to developing policies on their public health issues while practicing team building skills. Class will culminate with presentation of policy briefs through a persuasive advocacy speech.
Prerequisite: Must have completed SPHL610.
Restriction: Must be a graduate student in the School of Public Health.

SPHL625 Issues of Retirement: Theory and Practice (3 Credits)
Multidisciplinary examination of retirement phenomena, including theories of transition, government and private sector policies, social expectations, physical correlates, personal adjustments, and economic consequences. Emphasis upon research utilization.
Credit Only Granted for: HLHP625 or SPHL625.
Formerly: HLHP625.

SPHL689 Selected Problems in Health, Physical Education and Recreation (1-6 Credits)
Research projects in special areas in health, physical education and/or recreation which have interdisciplinary implications not covered in structured courses.
Formerly: HLHP689.

SPHL698 Special Topics in Public Health (3 Credits)
Topical and interdisciplinary courses of interest to master and doctoral students in the field of Public Health not currently covered by the program.
Prerequisite: Permission of SPHL-School of Public Health.

SPHL780 Interdisciplinary Issues in Aging (3 Credits)
Multidisciplinary approaches to the processes of aging to achieve a more holistic understanding. Pedagogical research dissemination, peer instruction, guest lecturing, and informal discussion. The demonstration of the multilateral nature of growing older. Discussion of cross-disciplinary and interdisciplinary research proposals.
Credit Only Granted for: HLHP780 or SPHL780.
Formerly: HLHP780.

STAT - Statistics and Probability

STAT400 Applied Probability and Statistics I (3 Credits)
Random variables, standard distributions, moments, law of large numbers and central limit theorem. Sampling methods, estimation of parameters, testing of hypotheses.
Prerequisite: 1 course with a minimum grade of C- from (MATH131, MATH141); or students who have taken courses with comparable content may contact the department.
Cross-listed with: DATA400.
Credit Only Granted for: DATA400, ENEE324, or STAT400.
Additional Information: Not acceptable toward graduate degrees in MATH/STAT/AMSC.

STAT401 Applied Probability and Statistics II (3 Credits)
Point estimation - unbiased and consistent estimators. Interval estimation. Minimum variance and maximum likelihood estimators. Testing of hypotheses. Regression, correlation and analysis of variance. Sampling distributions. Elements of non-parametric methods.
Prerequisite: 1 course with a minimum grade of C- from (STAT400, STAT410).
Additional Information: Not acceptable toward graduate degrees in MATH/STAT/AMSC.

STAT410 Introduction to Probability Theory (3 Credits)
Probability and its properties. Random variables and distribution functions in one and several dimensions. Moments. Characteristic functions. Limit theorems.
Prerequisite: 1 course with a minimum grade of C- from (MATH240, MATH461, MATH341); and 1 course with a minimum grade of C- from (MATH340, MATH241).
Cross-listed with: SURV410.
Credit Only Granted for: STAT410 or SURV410.

STAT420 Theory and Methods of Statistics (3 Credits)
Point estimation, sufficiency, completeness, Cramer-Rao inequality, maximum likelihood. Confidence intervals for parameters of normal distribution. Hypothesis testing, most powerful tests, likelihood ratio tests. Chi-square tests, analysis of variance, regression, correlation. Nonparametric methods.
Prerequisite: 1 course with a minimum grade of C- from (SURV410, STAT410); and a minimum grade of C- from (MATH410).
Cross-listed with: SURV420.
Credit Only Granted for: STAT420 or SURV420.

STAT422 Probability Models (3 Credits)
Random variables, Joint Distributions, Hierarchical Models, Random Samples, Algorithms for generating samples, Markov Chains, Poisson Processes, Stochastic Processes, Simulations.
Prerequisite: Minimum grade of C- in STAT400 or STAT410.
Credit Only Granted for: STAT498J or STAT422.
Formerly: STAT498J.

STAT426 Introduction to Data Science and Machine Learning (3 Credits)
An introductory course to the recent developments in the fields of data science and machine learning. Emphasis will be given to mathematical and statistical understanding of commonly used methods and processes.
Prerequisite: Minimum grade of C- in MATH241 or MATH340; and minimum grade of C- in MATH240, MATH461 or MATH341; and minimum grade of C- in STAT400 or STAT410; students who have taken courses with content comparable to STAT400/410 may request permission of the instructor.
Credit Only Granted for: STAT426 or CMSC320.

STAT430 Introduction to Statistical Computing with SAS (3 Credits)
Descriptive and inferential statistics. SAS software: numerical and graphical data summaries; merging, sorting and splitting data sets. Least squares, regression, graphics and informal diagnostics, interpreting results. Categorical data, lifetime data, time series. Applications to engineering, life science, business and social science.
Prerequisite: 1 course with a minimum grade of C- from (STAT400, STAT410); and must have completed or be concurrently enrolled in STAT401 or STAT420; students who do not meet the STAT401 or STAT420 requirement but who have taken a statistics course may contact the math department to confirm eligibility.

STAT440 Sampling Theory (3 Credits)
Simple random sampling. Sampling for proportions. Estimation of sample size. Sampling with varying probabilities. Sampling: stratified, systematic, cluster, double, sequential, incomplete.
Prerequisite: 1 course with a minimum grade of C- from (STAT401, STAT420).
Credit Only Granted for: STAT440 or SURV440.

STAT464 Introduction to Biostatistics (3 Credits)
Probabilistic models. Sampling. Some applications of probability in genetics. Experimental designs. Estimation of effects of treatments. Comparative experiments. Fisher-Irwin test. Wilcoxon tests for paired comparisons.
Prerequisite: 1 course with a minimum grade of C- from (MATH120, MATH136, or MATH140);.
Restriction: Junior standing or higher.
Credit Only Granted for: BIOE372 or STAT464.
Additional Information: Not acceptable toward degrees in MATH/STAT.

STAT470 Actuarial Mathematics (3 Credits)
Major mathematical ideas involved in calculation of life insurance premiums, including compound interest and present valuation of future income streams; probability distribution and expected values derived from life tables; the interpolation of probability distributions from values estimated at one-year multiples; the 'Law of Large Numbers' describing the regular probabilistic behavior of large populations of independent individuals; and the detailed calculation of expected present values arising in insurance problems.
Prerequisite: 1 course with a minimum grade of C- from (STAT400 or STAT410); and 1 course with a minimum grade of C- from (MATH340, MATH241).
Recommended: STAT400.

STAT498 Selected Topics in Statistics (1-6 Credits)
Topics of special interest to advanced undergraduate students will be offered occasionally under the general guidance of the MATH/STAT major committee. Students register for reading in statistics under this number.
Restriction: Permission of CMNS-Mathematics department.
Repeatable to: 16 credits.

STAT600 Probability Theory I (3 Credits)
Probability space; distribution functions and densities; Poissson limit theoreom; de Moivre-Laplace theorem; measure-theoretic definition of expectation; classification of measures on R; convergence of random variables; Radon-Nikodym theorem;LP spaces; conditional probabilities; independence of events, sigma-algebras and random variables; Bayes' theo rem; pi-systems and Dynkin systems; discrete Markov chains; random walks; gambler's ruin problem; Markov chains on a general phase space; Borel-cantelli lemmas; Kolmogorov inequality; three series theorem; laws of large numbers.
Prerequisite: STAT410.

STAT601 Probability Theory II (3 Credits)
Weak convergence of measures; characteristic functions; Central Limit Theorem and local limit theorem; stable laws; Kolmogorov consistency theorem (without proof); conditional expectations and martingales; optimal stopping theorem; convergence of martingales; Brownian motion; Markov processes and families; stochastic integral and Ito formula.
Prerequisite: STAT600.

STAT650 Applied Stochastic Processes (3 Credits)
Basic concepts of stochastic processes. Markov processes (discrete and continuous parameters), Random walks, Poisson processes, Birth and death processes. Renewal processes and basic limit theorems. Discrete time martingales, stopping times, optional sampling theorem. Applications from theories of stochastic epidemics, survival analysis and others.
Prerequisite: STAT410; or students who have taken courses with comparable content may contact the department.

STAT658 Advanced Applied Stochastic Processes II (3 Credits)
Advanced topics in applied stochastic processes, rotating among the headings of queueing theory, population proceses, and regenerative phenomena. Course includes disucssion of stochastic models and fields of application, Markov process theory including calculation and characterization of stationary distributions and diffusion approximations, renewal theory and Wiener-Hopf factorization theory.
Prerequisite: STAT650; and must have completed a graduate course in analysis. Or permission of instructor.
Recommended: STAT601 and STAT600.
Repeatable to: 6 credits if content differs.

STAT689 Research Interactions in Statistics (1-3 Credits)
The students participate in a vertically integrated (undergraduate, graduate and/or postdoctoral, faculty) research group. Format varies, but includes regular meetings, readings and presentations of material. See graduate program's online syllabus or contact the graduate program director for more information.
Restriction: Permission of instructor.
Repeatable to: 6 credits if content differs.

STAT698 Selected Topics in Probability (1-4 Credits)

STAT700 Mathematical Statistics I (3 Credits)
Sampling distributions including noncentral chi-squared, t, F. Exponential families, completeness. Sufficiency, factorization, likelihood ratio. Decision theory, Bayesian methods, minimax principle. Point estimation. Lehmann-Scheffe and Cramer-Rao theorems. Set estimation.
Prerequisite: STAT410; or students who have taken courses with comparable content may contact the department.

STAT701 Mathematical Statistics II (3 Credits)
Testing hypotheses: parametric methods. Neyman-Pearson lemma. Uniformly most powerful tests. Unbiased tests. Locally optimal tests. Large sample theory, asymptotically best procedures. Nonparametric methods, Wilcoxon, Fisher-Yates, median tests. Linear models, analysis of variance, regression and correlation. Sequential analysis.
Prerequisite: STAT700; or students who have taken courses with comparable content may contact the department.

STAT702 Survival Analysis (3 Credits)
Concepts/definitions of survival functions, hazard rate or hazard function, cumulative hazard functions, mean residual life, inversion formulas; Parametric models: exponential distribution, Weibull distribution; Censored/incomplete data and real data examples; right censored data, doubly censored data, interval censored data, truncated data; Nonparametric maximal likelihood estimator for the lifetime distribution under different types of censoring (e.g., Kaplan-Meier estimator), self-consistency estimators, the EM algorithm, applications of the empirical likelihood; Semiparametric models: accelerated lifetime model, proportional hazard model, the Cox model; Goodness of fit tests and diagnostic methods for model checking.
Prerequisite: STAT410 and STAT420; or students who have taken courses with comparable content may contact the department; or permission of instructor.

STAT705 Computational Statistics (3 Credits)
Modern methods of computational statistics and their application to both practical problems and research. S-Plus and SAS programming with emphasis on S-Plus. S-Plus objects and functions, and SAS procedures. Topics include data management and graphics, Monte Carlo and simulation, bootstrapping, numerical optimization in statistics, linear and generalized linear models, nonparametric regression, time series analysis.
Prerequisite: STAT700 or STAT420.
Recommended: Have some programming experience (any language).
Credit Only Granted for: STAT705 or STAT798C.
Formerly: STAT798C.

STAT707 Bayesian Statistics (3 Credits)
The essentials of Bayesian statistics with some advanced topics. Basic statistical decision theory. Bayesian paradigm. Prior and posterior distributions. Conjugate family. Hierarchical models. Bayesian linear regression. Bayes factors. Markov chain Monte Carlo. Metropolis-Hastings algorithm. Gibbs sampler. Bernstein von-Mise theorem. Posterior consistency. Potential advanced topics include variational Bayes, empirical Bayes, Bayesian inference of high-dimensional data and Bayesian non-parametric inference.
Prerequisite: STAT700; or permission of instructor .
Credit Only Granted for: STAT700 or STAT818B.
Formerly: STAT818B.

STAT712 Statistical Learning Theory (3 Credits)
Covers statistical machine learning and empirical process theory. The topics to be covered include: basics of statistical decision theory; concentration inequalities; supervised and unsupervised learning; empirical risk minimization; complexity-regularized estimation; generalization bounds for learning algorithms; VC dimension and Rademacher complexities; minimax lower bounds; online learning and optimization. Additionally, we will explore applications of these theories in areas like variational Bayes, high-dimensional statistics, generative model estimation, and various machine learning problems.
Prerequisite: STAT700, STAT701, STAT740, and STAT741.

STAT730 Time Series Analysis (3 Credits)
The methodology of probabilistic description and statistical analysis of (primarily stationary) random sequences and processes. Correlation functions, Gaussian processes, Hilbert-space methods including Wold decomposition and spectral representation, periodogram and estimation of spectral densities, parameter estimation and model identification for ARMA processes, linear filtering, Kalman-Bucy filtering, sampling theorems for continuous-time series, multivariate time series.
Prerequisite: STAT700; and must have completed a graduate course in analysis. Or permission of instructor.
Recommended: STAT701 and STAT650.

STAT740 Linear Statistical Models I (3 Credits)
Least squares, general linear models, estimability and Gauss-Markov theorem. Simple and multiple linear regression, analysis of residuals and diagnostics, polynomial models, variable selection. Qualitative predictors, one and two way analysis of variance, multiple comparisons, analysis of covariance. Nonlinear least squares. High-level statistical computer software will be used for data analysis throughout the course.
Prerequisite: STAT700 or STAT420.

STAT741 Linear Statistical Models II (3 Credits)
Continuation of STAT 740. Multiway layouts, incomplete designs, Latin squares, complete and fractional factorial designs, crossed and nested models. Balanced random effects models, mixed models, repeated measures.General mixed model, computational algorithms, ML and REML estimates. Generalized linear models, logistic and loglinear regression.
Prerequisite: STAT740.

STAT750 Multivariate Analysis (3 Credits)
Multivariate normal, Wishart's and Hotelling's distributions. Tests of hypotheses, estimation. Generalized distance, discriminant analysis. Regression and correlation. Multivariate analysis of variance; distribution of test criteria. Principal components, canonical correlations and factor analysis.
Prerequisite: STAT700 or STAT420.

STAT760 Statistics Practicum (3 Credits)
A semester long applied statistical project or statistical consulting project (a minimum 10 hours per week or 120 hours in total), in an internship of collaborative research-laboratory setting working on a substantive applied quantitative project with significant statistical content.
Prerequisite: Must have completed one year of graduate study in Mathematical Statistics.
Restriction: Permission of the Department of Mathematics .
Additional Information: Students must have project proposal approved by Statistics Director and Statistics Consulting Center Director.

STAT770 Analysis of Categorical Data (3 Credits)
Loglinear and logistic models. Single classification, two-way classification; contingency tables; tests of homogeneity and independence models, measures of association, distribution theory. Bayesian methods. Incomplete contingency tables. Square contingency tables - symmetry. Extensions to higher dimensional contingency tables.
Prerequisite: STAT430 and STAT420; or permission of CMNS-Mathematics department.

STAT798 Selected Topics in Statistics (1-4 Credits)

STAT799 Master's Thesis Research (1-6 Credits)

STAT808 Selected Topics in Probability (1-3 Credits)
Advanced topics of current interest.
Restriction: Permission of instructor.
Repeatable to: 18 credits.

STAT818 Selected Topics in Statistics (1-3 Credits)
Advanced topics of current interest.
Restriction: Permission of instructor.
Repeatable to: 18 credits.

STAT898 Pre-Candidacy Research (1-8 Credits)

STAT899 Doctoral Dissertation Research (1-8 Credits)

SURV - Survey Methodology

SURV400 Fundamentals of Survey and Data Science (3 Credits)
The course introduces the student to a set of principles of survey and data science that are the basis of standard practices in these fields. The course exposes the student to key terminology and concepts of collecting and analyzing data from surveys and other data sources to gain insights and to test hypotheses about the nature of human and social behavior and interaction. It will also present a framework that will allow the student to evaluate the influence of different error sources on the quality of data.
Prerequisite: STAT100; or permission of BSOS-Joint Program in Survey Methodology department.
Restriction: Course open to SURV certificate students, SURV Advanced Special Students, and SURV undergraduate minors. Graduate students from other departments may enroll with permission from the department.
Credit Only Granted for: SURV699M, SDSB340 or SURV400.
Formerly: SURV699M.

SURV410 Introduction to Probability Theory (3 Credits)
Probability and its properties. Random variables and distribution functions in one and several dimensions. Moments. Characteristic functions. Limit theorems.
Prerequisite: 1 course with a minimum grade of C- from (MATH240, MATH461, MATH341); and 1 course with a minimum grade of C- from (MATH340, MATH241).
Cross-listed with: STAT410.
Credit Only Granted for: STAT410 or SURV410.

SURV420 Theory and Methods of Statistics (3 Credits)
Point estimation, sufficiency, completeness, Cramer-Rao inequality, maximum likelihood. Confidence intervals for parameters of normal distribution. Hypothesis testing, most powerful tests, likelihood ratio tests. Chi-square tests, analysis of variance, regression, correlation. Nonparametric methods.
Prerequisite: 1 course with a minimum grade of C- from (SURV410, STAT410); and a minimum grade of C- from (MATH410).
Cross-listed with: STAT420.
Credit Only Granted for: STAT420 or SURV420.

SURV430 Fundamentals of Questionnaire Design (3 Credits)
Introduction to the scientific literature on the design, testing and evaluation of survey questionnaires, together with hands-on application of the methods discussed in class.
Restriction: Permission of BSOS-Joint Program in Survey Methodology department.
Credit Only Granted for: SURV430 or SURV630.

SURV440 Sampling Theory (3 Credits)
Simple random sampling, sampling for proportions, estimation of sample size, sampling with varying probabilities of selection, stratification, systematic selection, cluster sampling, double sampling, and sequential sampling.
Prerequisite: STAT401 or STAT420.
Credit Only Granted for: STAT440 or SURV440.

SURV600 Fundamentals of Survey and Data Science (3 Credits)
Introduces the student to a set of principles of survey and data science that are the basis of standard practices in these fields. The course exposes the student to key terminology and concepts of collecting and analyzing data from surveys and other data sources to gain insights and to test hypotheses about the nature of human and social behavior and interaction. It will also present a framework that will allow the student to evaluate the influence of different error sources on the quality of data.
Prerequisite: Any University of Maryland approved college-level statistics course.
Restriction: Permission of BSOS-Joint Program in Survey Methodology department; and must have graduate student status.
Credit Only Granted for: SURV699M, SURV400 or SURV600.

SURV611 Review of Statistical Concepts (3 Credits)
Basics of probability and statistics. Students will review basic probability concepts and probability distributions, the Central Limit Theorem and hypothesis testing, and linear and logistic regression. Throughout this course, students should develop and reinforce proper statistical intuition. This includes knowing how to identify a sample and a population and applying appropriate statistical methods such as hypothesis testing, as well being able to identify different types of data and using the proper methods for each type of data. By the end of the course, students should have a strong foundation in statistics with which they can start their graduate coursework.
Credit Only Granted for: SURV699M or SURV611.
Formerly: SURV699M.

SURV612 Ethical Considerations for Data Science Research (1 Credit)
The goal of research ethics is to protect human subjects from harm when they participate in a study. In the digital age, however, what constitutes "participation" has become blurry, especially with the rise of social media platforms and other online apps and services. Furthermore, new applications of big data raise important questions about how to protect consumers from harms, and what kinds of notice and consent should be obtained. This course provides an introduction and overview of research ethics in the 21st century and evaluates the many challenges to conducting ethical research.
Credit Only Granted for: SURV699A or SURV612.
Formerly: SURV699A.

SURV613 Machine Learning and AI for Social Science (3 Credits)
An introduction to machine learning and artificial intelligence techniques and their potential applications in the social sciences. The primary focus is on supervised machine learning, in which some observed outcome Y is predicted using a set of X variables. These methods focus on achieving maximum predictive performance over inference and therefore provide a different approach in comparison with traditional regression models, which primarily focus on causation. This course builds up to modern neural networks and AI with respect to both supervised and unsupervised machine learning, along with generative AI.
Recommended: Although this course will include a short introduction to R, some prior programming knowledge in R is assumed. If necessary, students are encouraged to work through one or more R tutorials prior to or during the first weeks of the course. Some resources can be found on the syllabus.
Credit Only Granted for: SURV613 or SURV699U.
Formerly: SURV699U.

SURV615 Statistical Modeling and Machine Learning I (3 Credits)
This is the first course in a two-term sequence in applied statistical methods and machine learning that are the basis in handling complex datasets. The topics covered include: overview on the quantitative research, linear regression, analysis of variance, inference, prediction, model diagnostics and selection and resampling methods. The emphasis will be to understand and apply the methods.
Prerequisite: Must have basic R Programming skills; and must have completed a two course sequence in probability and statistics; or students who have comparable content may contact the department for permission.
Restriction: Must be in Survey Methodology (Master's) program; or permission of instructor.

SURV616 Statistical Modeling and Machine Learning II (3 Credits)
Build on material presented in Statistical Methods and Machine Learning I. Topics include: categorical data analysis, logistic regression, model selection for inference and prediction, classification using K-means and neural networks, survival analysis, principal components, and factor analysis.
Prerequisite: SURV615.

SURV617 Applications of Statistical Modeling (3 Credits)
Designed for students on both the social science and statistical tracks for the two programs in survey methodology, will provide students with exposure to applications of more advanced statistical modeling tools for both substantive and methodological investigations that are not fully covered in other MPSM or JPSM courses. Modeling techniques to be covered include multilevel modeling (with an application to methodological studies of interviewer effects), structural equation modeling (with an application of latent class models to methodological studies of measurement error), classification trees (with an application to prediction of response propensity), and alternative models for longitudinal data (with an application to panel survey data from the Health and Retirement Study). Discussions and examples of each modeling technique will be supplemented with methods for appropriately handling complex sample designs when fitting the models. The class will focus on practical applications and software rather than extensive theoretical discussions.
Prerequisite: SURV615 and SURV616; or permission of instructor.
Credit Only Granted for: SURV617, SURV746, or SURV699R.
Formerly: SURV699R and SURV746.

SURV621 Fundamentals of Data Collection I (3 Credits)
First semester of a two-semester sequence that provides a broad overview of the processes that generate data for use in social science research. Students will gain an understanding of different types of data and how they are created, as well as their relative strengths and weaknesses. A key distinction is drawn between data that are designed, primarily survey data, and those that are found, such as administrative records, remnants of online transactions, and social media content. The course combines lectures, supplemented with assigned readings, and practical exercises. In the first semester, the focus will be on the error that is inherent in data, specifically errors of representation and errors of measurement, whether the data are designed or found. The psychological origins of survey responses are examined as a way to understand the measurement error that is inherent in answers. The effects of the mode of data collection (e.g., mobile web versus telephone interview) on survey responses also are examined.
Restriction: Permission of BSOS-Joint Program in Survey Methodology department.

SURV622 Fundamentals of Data Collection II (3 Credits)
This is the second course in a two-semester sequence that provides a broad overview of the processes that generate data for use in social science research. Students will gain an understanding of different types of data and how they are created, as well as their relative strengths and weaknesses. A key distinction is drawn between data that are designed, primarily survey data, and those that are found, such as administrative records, remnants of online transactions, and social media content. The course combines lectures, supplemented with assigned readings, and practical exercises. The second semester builds on the discussion of survey mode during the first semester, considering the role played by interviewers in telephone and in-person surveys and their effects on the data collected. Students next are introduced to the methods for extracting and re purposing found data for social science research. Methods for the classification of text, with an emphasis on automated coding methods, are introduced and selected applications considered (e.g., coding of open-ended survey responses, classification of the sentiments expressed in social media posts). Issues in using survey data and administrative records to measure change over time (longitudinal comparisons) are explored. The term concludes with an examination of methods for evaluating the quality of both designed and found data.
Prerequisite: Permission of Instructor required; or fundamentals of Data Collection I.

SURV624 Privacy Law (1 Credit)
To acquaint the students with the origins and basic principles of privacy law mainly in Europe. Furthermore, it will contrast the European privacy foundations with the U.S. approach. At the core of this course stands the new European General Data Protection Regulation (GDPR) and its applicability to specific cases and basic principles. Moreover, the course will cover current challenges to the existing privacy paradigms by big data and big data analytics.
Restriction: Permission of BSOS-Joint Program in Survey Methodology department.

SURV625 Applied Sampling (3 Credits)
Practical aspects of sample design. Topics include: probability sampling (including simple random, systematic, stratified, clustered, multistage and two-phase sampling methods), sampling with probabilities proportional to size, area sampling, telephone sampling, ratio estimation, sampling error estimation, frame problems, nonresponse, and cost factors.
Prerequisite: Must have completed a course in statistics approved by department.

SURV626 Sampling (2 Credits)
Practical aspects of sample design. The course will cover the main techniques used in sampling practice: simple random sampling, stratification, systematic selection, cluster sampling, multistage sampling, and probability proportional to size sampling. The course will also cover sampling frames, cost models, and sampling error (variance) estimation techniques.
Prerequisite: Permission of BSOS-Joint Program in Survey Methodology department; and must have taken at least a graduate level statistics course or an undergraduate level advanced statistics course.

SURV627 Experimental Design and Causal Inference (2 Credits)
Many of the questions we are interested in as researchers and practitioners are of a causal nature. We act upon the world; how can we tell if our actions have impact? How can we decide if an intervention would get us closer to our goals? In this course, we introduce the basic concepts from causal inference and econometrics, and show what makes a valid causal claim, and what would undo it. We then demonstrate how experiments can be used to evaluate causal hypotheses, and what options are available to conduct experiments in practice. Having discussed experimental data collection, we turn to the analysis of experiments, show how this, again, is linked to the logic of causal inference, and how to work with experimental data. We discuss how to design studies so that statistical inferences are informative and reliable. Next, we cover situations in which experiments might not be possible, and show how these can be addressed through study design ex ante and ex post through analysis.
Prerequisite: Basic knowledge of data analysis. Familiarity with the R programming language and the RStudio IDE.
Recommended: Experience in the use of SAS or STATA statistical analysis software.
Restriction: Permission of BSOS-Joint Program in Survey Methodology department.

SURV630 Questionnaire Design and Evaluation (3 Credits)
The stages of questionnaire design; developmental interviewing, question writing, question evaluation, pretesting, and questionnaire ordering and formatting. Reviews of the literature on questionnaire construction, the experimental literature on question effects, and the psychological literature on information processing. Examination of the diverse challenges posed by self versus proxy reporting and special attention is paid to the relationship between mode of administration and questionnaire design.
Restriction: Must be in the Survey and Data Science Doctoral or Master's Program, or the Applied Political Analytics Master's Program; or permission of the Joint Program in Survey Methodology.
Credit Only Granted for: SURV430 and SURV630.

SURV631 Questionnaire Design (2 Credits)
This course introduces students to the stages of questionnaire development. The course reviews the scientific literature on questionnaire construction, the experimental literature on question effects, and the psychological literature on information processing. It will also discuss the diverse challenges posed by self- versus proxy-reporting and special attention is paid to the relationship between mode of administration and questionnaire design. Students will also get hands-on experience in developing their own questionnaire.
Restriction: Permission of BSOS-Joint Program in Survey Methodology department.

SURV632 Cognition, Communication and Survey Measurement (3 Credits)
Major sources of survey error-such as reporting errors and nonresponse bias-from the perspective of social and cognitive psychology and related disciplines. Topics: psychology of memory and its bearing on classical survey issues (e.g., underreporting and telescoping); models of language use and their implications for the interpretation and misinterpretation of survey questions; and studies of attitudes, attitude change, and their possible application to increasing response rates and improving the measurement of opinions. Theories and findings from the social and behavioral sciences will be explored.

SURV635 Usability Testing for Survey Research (1 Credit)
Introduces the concepts of usability and usability testing and why they are needed for survey research. The course provides a theoretical model for understanding the respondent-survey interaction and then provides practical methods for incorporating iterative user-centered design and testing into the survey development process. The course provides techniques and examples for designing, planning, conducting and analyzing usability studies on web or mobile surveys
Recommended: Students should be familiar with the basics of questionnaire design. Experience with cognitive testing is a plus, but not a requirement.
Restriction: Must be in a major within the BSOS-Joint Program in Survey Methodology department; or permission of BSOS-Joint Program in Survey Methodology department.

SURV636 Sampling II (1 Credit)
Different applications of the methods and techniques covered in the Sampling I course. This is also an applied statistics methods course concerned almost exclusively with the design of data collection rather than data analysis. The course will concentrate on sampling applications to human populations, since this poses a number of particular problems not found in sampling of other types of units. The principles of sample selection, though, can be applied to many other types of populations.
Prerequisite: SURV626 or equivalent.
Recommended: Some experience with the R statistical computing software.
Repeatable to: 1 credit.

SURV650 Economic Measurement (3 Credits)
An introduction to the field of economic measurement. Sound economic data are of critical importance to policymakers, the business community, and others. Emphasis is placed on the economic concepts that underlie key economic statistics and the translation of those concepts into operational measures. Topics addressed include business survey sampling; the creation of business survey sampling frames; the collection of data from businesses; employment and earnings statistics; price statistics; output and productivity measures; the national accounts; and the statistical uses of administrative data. Lectures and course readings assume prior exposure to the tools of economic analysis.
Prerequisite: Must have completed a course in intermediate microeconomics.
Credit Only Granted for: SURV650 or SURV699L.
Formerly: SURV699L.

SURV656 Web Survey Methodology (2 Credits)
Fundamental concepts of web surveys and web survey design. The course is organized in 3 main sections which follow the way a proper web survey is organized: prefielding, fielding and post fielding.
Prerequisite: Must have completed SURV400; or must have completed SURV623; or permission of instructor. And permission of BSOS-Joint Program in Survey Methodology department.

SURV662 An Introduction to Small Area Estimation Methods (1 Credit)
There is a growing demand to produce reliable estimates of various socio-economic and health characteristics at both national and sub-national levels. However, data availability at the sub-national (small area) level from a survey is often limited by cost and thus analysts must make the best possible use of all available information. The course will begin with a history of small-area estimation and different uses of small-area statistics in both public and private sectors. This course will provide an introduction to the main concepts and issues in small estimation and describes various approaches for estimating different small area parameters. Topics include standard design-based methods, various traditional indirect methods and the state-of-the-art small-area estimation methods that use both Bayesian and empirical best prediction methods. Monte Carlo simulation results and data analysis using available statistical software will be presented.
Prerequisite: STAT400 and STAT401.
Restriction: Permission of instructor.

SURV665 Introduction to Real World Data Management (2 Credits)
Data is omnipresent in the contemporary world coming in different shapes and sized: from survey data to found data. In order to make use of such data through analysis it is necessary first to import and clean it. This is often one of the most time consuming and difficult parts of data analysis. In this course you will learn both the conceptual steps needed in preparing data for analysis as well as the practical skills to do this. The course will cover all the essential skills needed to prepare data be it survey data, administrative data or found data.
Restriction: Permission of BSOS-Joint Program in Survey Methodology department.

SURV667 Introduction to Record Linkage with Big Data Applications (2 Credits)
Methods to combine data on given entities (people, households, firms etc.) that are stored in different data sources. By showing the strengths of these methods and by showing how each of them are performed in practice using R, the course will demonstrate the various benefits of record linkage. Participants will also learn about potential challenges that record linkage projects may face.
Prerequisite: Basic statistical concepts; and intermediate knowledge of R.
Recommended: Familiarity with regular expressions, the R packages ggplot2 and tidyverse.
Restriction: Permission of BSOS-Joint Program in Survey Methodology department.

SURV673 Introduction to Python and SQL (1 Credit)
Basics of Python and SQL for data analysis.Students will explore real publicly-available datasets, using the data analysis toolsin Python to create summaries and generate visualizations. Students will learn thebasics of database management and organization, as well as learn how to code inSQL and work with PostgreSQL databases. By the end of the class, students shouldunderstand how to read in data from CSV files or from the internet and becomfortable using either SQL or Python to aggregate, summarize, describe, andvisualize these datasets.
Recommended: Background knowledge in programming in Python and SQL structures.

SURV675 Modern Workflows in Data Science (2 Credits)
Large data, fast pace of production, and collaboration are hallmarks of the new data environment. In this context, researchers must have a good understanding of data workflows and they must ensure consistent and reproducible practices in order to collaborate and consistently produce insights. This course deals with some of these essential topics. We will discuss the main types of workflows in data and survey sciences and how tools such as GitHub can enhance collaboration and insure reproducibility. We will also discuss the use of reproducible documents such as Rmarkdown or Jupyter Notebooks before covering how to work with distributed data using Spark. We will finish the course by discussing the use of dashboards and how to develop such tools using R Shiny.
Prerequisite: SURV665.
Recommended: R or a good knowledge of R base and tidyverse.
Restriction: Permission of BSOS-Joint Program in Survey Methodology department.
Credit Only Granted for: SURV699Y or SURV675.
Formerly: SURV699Y.

SURV699 Special Topics in Survey Methodology (1-6 Credits)
Credit according to time scheduled and organization of the course. Organized as a lecture series on specialized advanced topics in survey methodology.
Prerequisite: Must have completed a graduate-level course in statistics or quantitive methods; and must have familiarity with survey research methods.

SURV701 Analysis of Complex Sample Data (3 Credits)
Analysis of data from complex sample designs covers: the development and handling of selection and other compensatory weights; methods for handling missing data; the effect of stratification and clustering on estimation and inference; alternative variance estimation procedures; methods for incorporating weights, stratification and clustering, and imputed values in estimation and inference procedures for complex sample survey data; and generalized design effects and variance functions. Computer software that takes account of complex sample design in estimation.
Prerequisite: SURV625.

SURV702 Analysis of Complex Survey Data (2 Credits)
The development and handling of selection and other compensatory weights for survey data analysis; the effects of stratification and clustering on survey estimation and inference; alternative variance estimation procedures for estimated survey statistics; methods and computer software that take into account the effects of complex sample designs on survey estimation and inference; and methods for handling missing data, including weighting adjustment and imputation.
Prerequisite: One or more graduate courses in statistics covering techniques through OLS and logistic regression, a course in applied sampling methods.
Restriction: Permission of BSOS-Joint Program in Survey Methodology department.

SURV703 Computer-Based Content Analysis I (1 Credit)
Investigate the foundations of Natural Language Processing (NLP) as tool for analyzing natural language texts in the social sciences, thus providing an alternative to traditional ways of data generation through surveys. The course introduces general use cases for NLP, provides a guide to standard operations on text as well as their implementation in the Python-based Natural Language Toolkit (NLTK) and introduces the text mining functionalities of the WEKA Machine Learning workbench. The theory part of the course worth one credit can be supplemented by an optional project part worth another credit point.
Prerequisite: Background knowledge in programming in Python and SQL structures.
Recommended: SURV736.

SURV704 Computer-Based Content Analysis II (1 Credit)
Investigates the foundations of Natural Language Processing (NLP) as tool for analyzing natural language texts in the social sciences, thus providing an alternative to traditional ways of data generation through surveys. The course introduces general use cases for NLP, provides a guide to standard operations on text as well as their implementation in the Python-based Natural Language Toolkit (NLTK) and introduces the text mining functionalities of the WEKA Machine Learning workbench. The theory part of the course worth one credit can be supplemented by an optional project part worth another credit point
Prerequisite: SURV703; and background knowledge in programming in Python and SQL structures.
Recommended: SURV736.

SURV706 General Linear Models (2 Credits)
The main focus of this course lies on the introduction to statistical models and estimators beyond linear regression useful to social and economic scientists. It provides an overview of generalized linear models (GLM) that encompass non-normal response distributions to model functions of the mean. GLMs thus relate the expected mean E(Y) of the dependent variable to the predictor variables via a specific link function. This link function permits the expected mean to be non-linearly related to the predictor variables. Examples for GLMs are the logistic regression, regressions for ordinal data, or regression models for count data. GLMs are generally estimated by use of maximum likelihood estimation. The course thus not only introduces GLMs but starts with an introduction to the principle of maximum likelihood estimation.
Recommended: Sound understanding of Linear Regression Models, Calculus and Linear Algebra.
Restriction: Must have permission of BSOS-Joint Program in Survey Methodology.
Credit Only Granted for: SURV706 or SURV699J.
Formerly: SURV699J.

SURV720 Total Survey Error and Data Quality I (2 Credits)
Total error structure of sample survey data, reviewing current research findings on the magnitudes of different error sources, design features that affect their magnitudes, and interrelationships among the errors. Coverage, nonresponse, sampling, measurement, and postsurvey processing errors. For each error source reviewed, social science theories about its causes and statistical models estimating the error source are described. Empirical studies from the survey methodological literature are reviewed to illustrate the relative magnitudes of error in different designs. Emphasis on aspects of the survey design necessary to estimate different error sources. Relationships to show how attempts to control one error source may increase another source. Attempts to model total survey error will be presented.
Prerequisite: SURV625.
Restriction: Permission of instructor.
Credit Only Granted for: (SURV720 and SURV721) or SURV723.
Formerly: SURV723.

SURV721 Total Survey Error and Data Quality II (2 Credits)
Second part of a review of total survey error structure of sample survey data. Reviewing current research findings on the magnitudes of different error sources. Students will continue work on an independent research project which provides empirical investigation of one or more error source. An analysis paper presenting findings of the project will be submitted at the end of the course.
Prerequisite: SURV720.
Restriction: Permission of instructor.
Credit Only Granted for: (SURV720 and SURV721) or SURV723.
Formerly: SURV723.

SURV725 Item Nonresponse and Imputation (1 Credit)
Missing data are a common problem which can lead to biased results if the missingness is not taken into account at the analysis stage. Imputation is often suggested as a strategy to deal with item nonresponse allowing the analyst to use standard complete data methods after the imputation. However, several misconceptions about the aims and goals of imputation make some users skeptical about the approach. In this course we will illustrate why thinking about the missing data is important and clarify which goals a useful imputation method should try to achieve.
Prerequisite: Be comfortable with generalized linear models and basic probability theory through coursework or work experience; and familiarity with the statistical software R.
Restriction: Permission of BSOS-Joint Program in Survey Methodology department.

SURV726 Multiple Imputation (1 Credit)
This course will provide a detailed introduction to multiple imputation, a convenient strategy for dealing with (item) nonresponse in surveys. We will motivate the concept and illustrate why multiple imputation should generally be preferred over single imputation methods. The main focus of the course will be on strategies to generate (multiple) imputations and how to deal with common problems when applying the methods for large scale surveys. We will also discuss various options for assessing the quality of the imputations. All concepts will be demonstrated using software illustrations in R.
Prerequisite: Be comfortable with generalized linear models and basic probability theory through coursework or work experience; and familiarity with the statistical software R; and must have completed Surv 725 Item Nonresponse and Imputation or be familiar with the content through relevant work experience.
Restriction: Permission of BSOS-Joint Program in Survey Methodology department.

SURV727 Fundamentals of Computing and Data Display (3 Credits)
The first part of this course provides an introduction to web scraping and APIs for gathering data from the web and then discusses how to store and manage (big) data from diverse sources efficiently. The second part of the course demonstrates techniques for exploring and finding patterns in (non-standard) data, with a focus on data visualization. The course focuses on R as the primary computing environment, with excursus into SQL and Big Data processing tools.
Restriction: Must be in a major within the BSOS-Joint Program in Survey Methodology department; or permission of BSOS-Joint Program in Survey Methodology department.
Additional Information: Students without any R knowledge are encouraged to work through one or more R web tutorials prior or during the first weeks of the course.

SURV730 Measurement Error Models (1 Credit)
Measurement error in survey data can significantly distort analyses of substantive interest. Means, totals, and proportions will be off if the average answer people give is inaccurate. However, measurement error distorts not only estimates of means but can also severely bias apparent relationships, conditional probabilities, means differences, and other regression-type analyses. To remove such biases it is therefore essential to estimate the extent of measurement error in survey variables. This can be done using a gold standard or, in the absence of such a standard, modeling the error. This course introduces the latter and trains students to perform regression analyses without the influence of measurement error.
Prerequisite: SURV623 or SURV630; or have equivalent survey research experience. And must have completed a basic statistics course in regression modeling.
Restriction: Permission of BSOS-Joint Program in Survey Methodology department.

SURV735 Data Privacy and Data Confidentiality (2 Credits)
This course will provide a gentle introduction to statistical disclosure control with a focus on generating synthetic data for maintaining the confidentiality of the survey respondents. The first part of the course will introduce several traditional approaches for data protection that are widely used at statistical agencies. Some limitations of these approaches will also be discussed. The second part of the course will introduce synthetic data as a possible alternative. This part of the course will discuss different approaches to generating synthetic datasets in detail. Possible modeling strategies and analytical validity evaluations will be assessed and potential measures to quantify the remaining risk of disclosure will be presented. To provide the participants with hands on experience, all steps will be illustrated using simulated and real data examples in R.
Prerequisite: Must have familiarity with the statistical software R; and must have completed a basic statistics course in regression modeling.
Restriction: Permission of BSOS-Joint Program in Survey Methodology department.

SURV736 Introduction to Web Scraping with R (1 Credit)
Provides a condensed overview of web technologies and techniques to collect data from the web in an automated way. To this end, students will use the statistical software R. The course introduces fundamental parts of web architecture and data transmission on the web. Furthermore, students will learn how to scrape content from static and dynamic web pages and connect to APIs from popular web services. Finally, practical and ethical issues of web data collection are discussed.
Prerequisite: Students are expected to be familiar with the statistical software R.
Recommended: Knowledge about the ?tidyverse? packages, in particular, dplyr, plyr, magrittr, and stringr.
Restriction: Permission of BSOS-Joint Program in Survey Methodology department.

SURV740 Fundamentals of Inference (3 Credits)
Focuses on the fundamentals of statistical inference in the finite population setting. Overview and review fundamental ideas of making inferences about populations. Basic principles of probability sampling; focus on differences between making predictions and making inferences; explore the differences between randomized study designs and observational studies; consider model-based vs. design-based analytic approaches; review techniques designed to improve efficiency using auxiliary information; and consider non-probability sampling and related inferential techniques.
Prerequisite: SURV410 and SURV420; or (SURV615 and SURV616); or permission of Instructor required.
Restriction: Must be in a major within the BSOS-Joint Program in Survey Methodology department; or permission of BSOS-Joint Program in Survey Methodology department.

SURV742 Inference from Complex Surveys (3 Credits)
Inference from complex sample survey data covering the theoretical and empirical properties of various variance estimation strategies (e.g., Taylor series approximation, replicated methods, and bootstrap methods for complex sample designs). Incorporation of those methods into inference for complex sample survey data. Variance estimation procedures applied to descriptive estimators and to analysis of categorical data. Generalized variances and design effects presented. Methods of model-based inference for complex sample surveys examined, and results contrasted to the design-based type of inference used as the standard in the course. Real survey data illustrating the methods discussed. Students will learn the use of computer software that takes account of the sample design in estimation.
Prerequisite: SURV440.

SURV745 Practical Tools for Study Design and Inference (3 Credits)
A statistical methods class appropriate for second year Master's students and PhD students. The course will be a combination of hands-on applications and general review of the theory behinddifferent approaches to sampling and weighting. Topics covered include sample size calculations using estimation targets based on relative standard error, margin of error, and power requirements. Use of mathematical programming to determine sample sizes needed to achieve estimation goals for a series of subgroups and analysis variables. Resources for designing area probability samples. Methods of sample allocation for multistage samples. Steps in weighting, including computation of base weights, non response adjustments, and uses of auxiliary data. Non response adjustment alternatives, including weighting cell adjustments, formation of cells using regression trees, and propensity score adjustments. Weighting via post stratification, raking, general regression estimation, and other types of calibration.
Prerequisite: SURV615, SURV616, and SURV625; or permission of instructor.

SURV750 Step by Step Survey Weighting (1 Credit)
Learn to calculate analysis weights for various survey designs in a real-world setting. We will cover topics on calculating base weights for single- and multistage designs, adjusting weights for unknown study eligibility and nonresponse using a few techniques, and aligning survey estimates with known population values through weight calibration. We will use specialized software for the procedures mentioned. This course will emphasize R but some examples in SAS and Stata are also discussed.
Prerequisite: SURV440, or course in sampling theory; and SURV626, or course in applied sampling.
Recommended: Some experience with variance estimation (e.g., SURV742), statistical analysis using survey data, and the R statistical computing software.

SURV751 Introduction to Big Data and Machine Learning (1 Credit)
This is an introduction to the uses and methods of working with Big data. Students explore how Big Data concepts, processes and methods can be used within the context of Survey Research.
Prerequisite: Familiarity with the statistical software R.
Restriction: Permission of BSOS-Joint Program in Survey Methodology department.
Additional Information: Familiarity with model building and model selection as well as the R program is not required but could also be helpful. Students without prior knowledge in R should plan on using free online resources to make themselves familiar with the basics of this statistical programming language.

SURV752 Introduction to Data Visualization (1 Credit)
Data visualization is one of the most powerful tools to explore, understand and communicate patterns in quantitative information. At the same time, good data visualization is a surprisingly difficult task and demands three quite different skills: substantive knowledge, statistical skill, and artistic sense. The course is intended to introduce participants to a) key principles of analytic design and useful visualization techniques for the exploration and presentation of univariate and multivariate data. This course is highly applied in nature and emphasizes the practical aspects of data visualization in the social sciences. Students will learn how to evaluate data visualizations based on principles of analytic design, how to construct compelling visualizations using the free statistics software R, and how to explore and present their data with visual methods.
Prerequisite: Basic statistics understanding and bivariate linear regression.
Recommended: Experience in the use of statistical software package R.
Restriction: Permission of BSOS-Joint Program in Survey Methodology department.

SURV753 Machine Learning II (2 Credits)
Social scientists and survey researchers are confronted with an increasing number of new data sources such as apps and sensors that often result in (para)data structures that are difficult to handle with traditional modeling methods. At the same time, advances in the field of machine learning (ML) have created an array of flexible methods and tools that can be used to tackle a variety of modeling problems. Against this background, this course discusses advanced ML concepts such as cross validation, class imbalance, Boosting and Stacking as well as key approaches for facilitating model tuning and performing feature selection. In this course we also introduce additional machine learning methods including Support Vector Machines, Extra-Trees and LASSO among others. The course aims to illustrate these concepts, methods and approaches from a social science perspective. Furthermore, the course covers techniques for extracting patterns from unstructured data as well as interpreting and presenting results from machine learning algorithms. Code examples will be provided using the statistical programming language R.
Prerequisite: SURV751; or comparable knowledge or experience.
Recommended: Familiarity with the statistical programming language R.

SURV772 Survey Design Seminar (3 Credits)
Students present solutions to design issues presented to the seminar. Readings are selected from literatures not treated in other classes and practical consulting problems are addressed.
Credit Only Granted for: (SURV770 and SURV771) or SURV772.
Formerly: SURV770 and SURV771.

SURV798 Advanced Topics in Survey Methodology (3 Credits)
Individual instruction.
Repeatable to: 12 credits if content differs. Cross-listed with STAT798.
Credit Only Granted for: STAT798 or SURV798.

SURV819 Doctoral Research Seminar in Survey Methodology (1-6 Credits)
This is the first, two term seminar introducing the doctoral student to areas of integration of social science and statistical science approaches in the design, collection, and analysis of surveys.
Restriction: Permission of instructor.

SURV829 Doctoral Research Seminar in Survey Methodology (3-6 Credits)
An advanced research seminar for students preparing to do research or take doctoral comprehensive examinations.
Restriction: Permission of instructor.
Repeatable to: 6 credits if content differs.

SURV898 Pre-Candidacy Research (1-8 Credits)

SURV899 Doctoral Dissertation Research (1-8 Credits)

TDPS - Theatre, Dance and Performance Studies

TDPS408 Seminar in Theory and Practice of Critical Difference (3 Credits)
This interdisciplinary seminar examines expressive culture as performed in works of dance, theatre, music, and digital media.
Repeatable to: 6 credits if content differs.

TDPS440 Arts Leadership Seminar (3 Credits)
An advanced seminar that connects arts leadership to current trends in technology, demographics, policy, and the economy. Through an investigation of current events, leadership theory, and case studies and guest speakers from the field, students will evaluate arts leadership as a profession and develop their own unique leadership identity. Topics included strategic management, organizational culture, ethics, decision making, and partnerships.
Prerequisite: ARHU240; or permission of instructor.
Cross-listed with: ARHU440.
Credit Only Granted for: ARHU440 or TDPS440.

TDPS441 Arts Entrepreneurship: Theory and Practice (3 Credits)
Establishes arts entrepreneurship as a unique discipline with the goal of connecting creative initiatives (products, artforms, and programs) to audiences, resources, and communities. Introduces students to the ways in which creative initiatives both create value and offer solutions to social, political, environmental, and cultural issues. Students will develop artist impact statements and identify different contexts and ways to apply their talents and creative initiatives in society.
Prerequisite: ARHU240 or TDPS240; or permission of instructor.
Recommended: ARHU440 or TDPS440.
Cross-listed with: ARHU441.
Jointly offered with: ARHU640, TDPS640.
Restriction: Limited to 4 undergraduate students (2 in ARHU and 2 in TDPS).
Credit Only Granted for: TDPS458E, ARHU441, TDPS441, ARHU640 or TDSP640.
Formerly: TDPS458E.

TDPS458 Special Topics in Advanced Performing Arts (1-3 Credits)
Designed for performing arts students. Offers instruction at an advanced level in various aspects of performance such as Voice for the Performing Arts, Movement for the Performing Arts, Acting for the Performing Arts, Partner Dance and a myriad of specific aspects within these genres.
Prerequisite: Permission of ARHU-School of Theatre, Dance & Performance Studies department.
Repeatable to: 9 credits if content differs.

TDPS469 Advanced Practicum in Stage Management (1-3 Credits)
A graded course in stage management for theatre and/or dance productions. A hands-on laboratory experience.
Prerequisite: Minimum of 2 credits from TDPS479.
Restriction: Permission of ARHU-School of Theatre, Dance & Performance Studies department.
Repeatable to: 9 credits.

TDPS470 Production Management (3 Credits)
To familiarize students with techniques and skills required of a Production Manager in a theatrical production. Focus will also be given to the field of event management.
Prerequisite: TDPS201, THET222, THET223, and THET116; and permission of ARHU-School of Theatre, Dance & Performance Studies department.

TDPS479 Production Practicum (1-3 Credits)
A graded course in a specified practical aspect of mounting a theatre or dance production. It is a hands-on, purely laboratory experience.
Prerequisite: TDPS201.
Repeatable to: 10 credits if content differs.
Credit Only Granted for: TDPS479 or THET479.
Formerly: THET479.

TDPS640 Arts Entrepreneurship: Theory and Practice (3 Credits)
Establishes arts entrepreneurship as a unique discipline with the goal of connecting creative initiatives (products, artforms, and programs) to audiences, resources, and communities. Introduces students to the ways in which creative initiatives both create value and offer solutions to social, political, environmental, and cultural issues. Students will develop artist impact statements and identify different contexts and ways to apply their talents and creative initiatives in society.
Cross-listed with: ARHU640.
Credit Only Granted for: ARHU640, TDPS640, or THET669U.
Formerly: THET669U.

TDPS641 Arts Entrepreneurship Seminar (3 Credits)
Active seminar on special topics of interest delivered through practical application of theoretical and developing knowledge. Utilizes ongoing programs at the Clarice Smith Performing Arts Center as a laboratory for analyzing and contributing to community-based programs through the lens of arts entrepreneurship. Advances students' understanding of and experience with the nuanced and complex work of arts co-creation, citizenship, partnerships, engagement, and impact.
Prerequisite: ARHU640 or TDPS640; or permission of instructor.
Cross-listed with: ARHU641.
Credit Only Granted for: TDPS641 or ARHU641.

TDPS789 Professional Development in Dance and Theatre (1 Credit)
This course will introduce graduate students to the academic job market, competitive fellowships, and ALT-AC (alternative academic) careers. Topics will include the interdisciplinary job market, cover letters, cv's, teaching and research statements, the teaching/artist portfolio, the diversity statement, interfolio, letters of recommendation, writing samples, websites, interviewing, and careers beyond academia.
Cross-listed with: AMST789.
Repeatable to: 4 credits.
Formerly: THET669K, DANC689F.

THET - Theatre

THET408 Seminar: Theory and Performance Studies (3 Credits)
Studies in theatre theory and performance studies from classical antiquity to the present.
Repeatable to: 12 credits if content differs.

THET411 Voice for the Actor II (3 Credits)
Learn the International Phonetic Alphabet (IPA) and apply to exploration of sound and language. Designed to increase voice and speech awareness, and create a base knowledge from which to approach any accent or dialect.
Prerequisite: THET324 or THET325; and must audition; and permission of ARHU-School of Theatre, Dance & Performance Studies department.
Restriction: Junior standing or higher.

THET420 Language and the Actor (3 Credits)
Explores the actor's relationship to language, particularly heightened poetic language, in order to: develop the ability to embody language and vocally and physically project the images; apply an intellectual understanding of the inherent structural, poetic, and rhetorical techniques of heightened language in combination with action theory; and access the inner states of character while expressing them through text.
Prerequisite: THET325 or THET324; and must audition; and permission of ARHU-School of Theatre, Dance & Performance Studies department.

THET424 Movement II: Advanced Studies in Movement and Mask Theatre (3 Credits)
A deeper exploration of how to use the actor's instrument for dramatic expression. Continuing work in the F.M. Alexander Technique and foundational exercise to help actors learn what they need to prepare for rehearsal and performance. Other techniques may include theatrical styles, physical character, dramatic use and play with space and rhythm and masks.
Prerequisite: THET325 or THET324; and must audition; and permission of ARHU-School of Theatre, Dance & Performance Studies department.
Restriction: Junior standing or higher.

THET425 Actor's Process II (3 Credits)
A deeper exploration of the work begun in THET325. A continuation of creating a personal process through which the actor can confidently approach any genre of play. Special focus on status and subtext and the world of the playwright.
Prerequisite: THET325; and must audition; and permission of ARHU-School of Theatre, Dance & Performance Studies department.

THET426 Theatrical Clown (3 Credits)
Progression of developing individual clown characters through methods based on European pedagogy which emphasizes a physical and technical approach to actor training.
Prerequisite: THET324 or THET325; and must Audition.
Restriction: Permission of ARHU-School of Theatre, Dance & Performance Studies department.

THET428 Special Topics in Advanced Theatre and Performance (1-3 Credits)
This course is offered as part of the School of Theatre, Dance, and Performance Studies' Artist in Residence program. Topics covered may include: Intercultural Theatre; Performance Art; Puppetry; Solo Performance; or Theatrical Design.
Prerequisite: TDPS201, THET116, THET222, and THET223; and permission of ARHU-School of Theatre, Dance & Performance Studies department.
Restriction: Junior standing or higher.
Repeatable to: 3 credits if content differs.
Additional Information: Incorporate the change from THET 114 to TDPS 201, listing both numbers, as students will take the prerequisite under either number. To change the catalog description to reflect the proper unit name as the School of Theatre, Dance, and Performance Studies.

THET429 Actor's Studio (1-3 Credits)
Participation in dramatic roles executed under faculty supervision in the department's productions. Eligible students must make commitments and plan performances with course instructor during pre-registration.
Restriction: Permission of ARHU-School of Theatre, Dance & Performance Studies department.
Repeatable to: 10 credits.

THET435 Advanced Costume Construction (3 Credits)
The course is taught in a presentation/practical application format. Students will learn advanced techniques in draping and pattern development and develop proficiency in communication of design and construction choices.
Prerequisite: THET284 and THET384; and portfolio review; and permission of ARHU-School of Theatre, Dance & Performance Studies department.
Jointly offered with: THET635.
Credit Only Granted for: THET435 or THET635.

THET440 Advanced Playwriting (3 Credits)
Ensemble-based writer's workshop. It is the second part of a two-course sequence and is designed for students who already have a foundation in the basics of playwriting or who are other wise well-versed in the art of theatre and dramatic structure. Through exploratory writing sequences, the reading of full-length plays, and in-class readings of work-in-progress, students will continue to deepen their craft and develop the script for a new full-length play.
Prerequisite: THET240 or THET340; or permission of instructor. And permission of ARHU-School of Theatre, Dance & Performance Studies department.
Restriction: Permission of ARHU-School of Theatre, Dance & Performance Studies department.
Credit Only Granted for: THET440 or THET499P.
Formerly: THET499P.

THET447 Technologies of Japanese Performance (3 Credits)
Explores technologies of performance in Japan across the centuries. We will focus on concepts of likeness and liveness as they manifest in performance's mythical origins, the traditions of noh drama, the popular, commercial theatres of kabuki, bunraku, and Takarazuka, and contemporary experiments with robotics, Vocaloids, and other new technologies. Taught in English.
Cross-listed with: JAPN447.
Credit Only Granted for: THET447 or JAPN447.

THET451 Musical Theatre Workshop I (3 Credits)
Development of the ability to move, act and express through the media of lyric and music.
Prerequisite: Must audition.
Restriction: Permission of ARHU-School of Theatre, Dance & Performance Studies department.

THET452 Musical Theatre Workshop II (3 Credits)
Development of the ability to move, act and express through the media of lyric and music from the integrated musicals of the 1960s through the development of concert and rock/pop musicals.
Prerequisite: Must audition.
Restriction: Permission of ARHU-School of Theatre, Dance & Performance Studies department.

THET465 History of Fashion for the Theatre (3 Credits)
A survey of Western clothing from the Ancient Worlds through 20th Century. A discussion of the cultural contexts of various trends in fashion through an examination of art, industry and textiles.
Prerequisite: THET116; or permission of instructor.
Restriction: Sophomore standing or higher.

THET469 Study Abroad Special Topics IV (1-6 Credits)
Special topics course taken as part of an approved study abroad program.
Repeatable to: 15 credits if content differs.

THET471 Design Studio in Scenery (3 Credits)
Advanced study of scenic design for the theatre. Particular design projects will vary.
Prerequisite: THET371; and permission of ARHU-School of Theatre, Dance & Performance Studies department. Jointly offered with THET639.
Credit Only Granted for: THET471 or THET639.

THET472 Scene Painting (3 Credits)
Scene painting techniques and materials. Three-dimensional realistic scenery and non-realistic two-dimensional projects.
Prerequisite: TDPS201; or permission of ARHU-School of Theatre, Dance & Performance Studies department.

THET473 Rendering for the Theatre II (3 Credits)
Continued study in rendering techniques and graphic skills for theatrical design presentation. Emphasis on style, technique and use of different artistic media.
Prerequisite: THET373; or permission of instructor.

THET474 Advanced Stage Management (3 Credits)
Intensive practical study of the techniques and procedures for stage management.
Prerequisite: THET274; and permission of ARHU-School of Theatre, Dance & Performance Studies department.
Restriction: Permission of ARHU-School of Theatre, Dance & Performance Studies department; and sophomore standing or higher.

THET475 History of Art, Architecture, and Decor for the Theatre (3 Credits)
Study of Western art, architecture, and decor and their practical application to theatrical production.
Prerequisite: TDPS201, THET116, THET222, and THET223; and permission of ARHU-School of Theatre, Dance & Performance Studies department.
Jointly offered with: THET670.
Credit Only Granted for: THET475 or THET670.

THET477 Design Studio in Lighting (3 Credits)
Designed for students who have successfully completed THET377 and wish to further develop their lighting design skills. Emphasis is on theoretical design of productions and realized light lab projects. Particular design projects will vary.
Prerequisite: THET377; and permission of ARHU-School of Theatre, Dance & Performance Studies department. Jointly offered with THET659.
Credit Only Granted for: THET477 or THET659.

THET480 Advanced Sound Design (3 Credits)
Students will dive deeper into the technical elements of sound design, developing a working understanding of both software editing tools as well as the primary components of a live sound system.
Prerequisite: THET380 and permission of the School of Theatre, Dance, and Performance Studies.

THET481 Theatre Graphics II: Computer Assisted Design (3 Credits)
Study and practical application of computer generated graphical design for use in theatrical production.
Prerequisite: THET114 or TDPS201; and THET116; and permission of ARHU-Theatre department.
Restriction: Sophomore standing or higher.

THET482 Scene Painting II (3 Credits)
Advanced study of theatrical scenic painting.
Prerequisite: THET472; or permission of instructor.
Restriction: Sophomore standing or higher.

THET488 Special Topics in Theatre History Before 1800 (3 Credits)
Topics in the history of world theatre and performance from the Greeks through 1800.
Repeatable to: 12 credits if content differs.

THET489 Special Topics in Theatre History from 1800 to Present (3 Credits)
Topics in the history of world theatre and performance from 1800 to present.
Repeatable to: 12 credits if content differs.

THET491 Theatrical Rendering Using Photoshop (3 Credits)
A studio course in rendering for the theatre. The course focuses primarily on traditional approaches to perspective drawing, space, texture, color and lighting rendering using Photoshop. Photoshop tools and techniques; preparing three-dimensional objects for accurate rendering; and techniques for Photoshop rendering and lighting of three-dimensional objects and architectural forms. This class primarily has an emphasis on rendering/uses for scenic design.
Prerequisite: THET471.
Credit Only Granted for: THET491 or THET428O.
Formerly: THET428O.

THET497 Non-Traditional Theatre (3 Credits)
Seminar exploring American and European experimental performance since 1960. Topics include experimental theatre, performance art, pornography and performance, gender and performance, and popular culture and performance. Topics are treated historically and theoretically. Student-produced performance projects are an important component of the seminar.

THET498 Seminar: Theatre History (3 Credits)
Studies in theatre history from classical antiquity to the present.
Prerequisite: THET488 or THET489.
Restriction: Senior standing; and permission of instructor.
Repeatable to: 6 credits if content differs. Jointly offered with THET698.
Credit Only Granted for: THET498 or THET6 98.

THET499 Independent Study (1-3 Credits)
An independent study course in which each student completes an assigned major theatre project under close faculty supervision. Projects may culminate with term papers, scenic or costume designs, or a stage production.
Restriction: Permission of ARHU-School of Theatre, Dance & Performance Studies department.
Repeatable to: 6 credits.

THET600 Introduction to Graduate Research Methods (3 Credits)
Basic skills in theatre research.
Restriction: Must be a graduate student in a Theatre program. Also offered as: THET700.
Credit Only Granted for: THET600 or THET700.
Additional Information: Only students in the doctoral program may register for THET700.

THET606 Teaching Theatre (1 Credit)
Strategies and materials for teaching a typical introductory course in theatre, with emphasis on specific problems of classroom instruction (e.g., creating a supportive climate, promoting active learning by students, constructing appropriate tests, adapting methods to content, and resolving discipline problems).

THET608 Seminar: Theory and Performance Studies (3 Credits)
A repeatable seminar on special topics in theory of the Theatre and Performance Studies.
Recommended: THET700 and THET600.
Repeatable to: 9 credits if content differs. Jointly offered with THET408.
Credit Only Granted for: THET40 8 or THET608.

THET619 Special Topics in Theatre (2-6 Credits)
This is a rotating "special topics" course that will address the history and theory of theatre, performance, and design.
Restriction: Permission of ARHU-School of Theatre, Dance & Performance Studies department.
Repeatable to: 12 credits if content differs.

THET632 Playwriting (3 Credits)
Lessons in playwriting, including character, plot, dramatic structure, dialogue, exposition, setting, and creating theatrical images.
Restriction: Permission of ARHU-School of Theatre, Dance & Performance Studies department.

THET633 Figure Drawing for Theatre Design (3 Credits)
Figure Drawing is designed to give students the necessary drawing skills that are required when drawing and painting for the theatre. We will study anatomy, figure/ground relationships, composition plotting and layout, planar value, light and shadow analysis, color theory and the fundamentals of perspective and how this applies to theatre design.
Credit Only Granted for: THET633 or THET669F.
Formerly: THET669F.

THET635 Graduate Costume Construction (3 Credits)
The course is taught in a presentation/practical application format. Students will learn advanced techniques in draping and pattern development and develop proficiency in communication of design and construction choices.
Prerequisite: THET284 and THET384; and portfolio review; and permission of ARHU-School of Theatre, Dance & Performance Studies department.
Jointly offered with: THET435.
Credit Only Granted for: THET435 or THET635 .

THET636 Photoshop for Theatrical Rendering (3 Credits)
Photoshop tools and techniques; preparing three-dimensional objects for accurate rendering; and techniques for Photoshop rendering and lighting of three-dimensional objects and architectural forms.
Credit Only Granted for: THET636 or THET669P.
Formerly: THET669P.

THET639 Graduate Design Studio - Scenery (3 Credits)
A repeatable course that allows students to progress in their design training through a series of carefully and individually structured assignments and projects.
Restriction: Permission of ARHU-School of Theatre, Dance & Performance Studies department.
Repeatable to: 12 credits if content differs.
Credit Only Granted for: THET471 or THET639.

THET642 Thesis Development (2 Credits)
Focus on writing the scripts for the thesis projects that will be performed in year three in the Festival of New Works. The course is designed to compose and finish a story in the form of a play or devised script during the course of the semester. Students will hone skills of listening and critique, and to provide a forum in which you can share and garner feedback on your work.
Restriction: Permission of ARHU-School of Theatre, Dance & Performance Studies department.

THET643 Puppetry and Performance (3 Credits)
Students will learn the history and techniques of puppetry (Western and Non-Western).
Restriction: Permission of ARHU-School of Theatre, Dance & Performance Studies department.

THET645 Graduate Rendering for Costume Design (3 Credits)
Advance study in rendering techniques for theatrical design presentation.
Credit Only Granted for: THET669R or THET645.
Formerly: THET669R.

THET649 Graduate Design Studio - Costume (3 Credits)
A series of carefully and individually structured assignments and projects that allows students to progress in their design training.
Repeatable to: 12 credits if content differs.
Credit Only Granted for: THET483 or THET649.

THET659 Graduate Design Studio - Lighting (3 Credits)
We will focus on connecting subject matter to light. Questions of meaning, structure, process, and intent will be investigated. The class will also explore the qualities and functions of light, what light can and cannot communicate. Students will develop a visual and conceptual vocabulary. Emphasis will be placed on process, both intellectual and practical.
Jointly offered with: THET477.
Restriction: Must not have completed THET477; and permission of ARHU-School of Theatre, Dance & Performance Studies department.
Repeatable to: 12 credits if content differs.
Credit Only Granted for: THET477 or THET659.

THET669 Independent Study (1-3 Credits)

THET670 History of Art, Architecture, and Decor for the Theatre (3 Credits)
Study of Western art, architecture, and decor and their practical application to theatrical production.
Recommended: THET600.
Jointly offered with: THET475.
Credit Only Granted for: THET475 or THET670.

THET672 Scenography (3 Credits)
An advanced design studio which takes a comprehensive approach to design spanning across lines between specific disciplines and explores Scenography as an art form. Students are expected to concentrate in their primary design area while simultaneously conceiving, coordinating and developing other scenographic elements.

THET678 Collaborative Design & Production for Performance (3 Credits)
A 3rd year capstone course co-taught by design faculty and invited professional artists and designers. 2nd year students can take the class by special permission. This is an advanced studio class in design collaboration. Students will design two theoretical projects under the supervision of two design faculty members and guest directors.
Restriction: Permission of ARHU-School of Theatre, Dance & Performance Studies department.
Repeatable to: 9 credits.

THET679 Graduate Design Studio - Multimedia Design (3 Credits)
A repeatable course that allows students to progress in their design training through a series of carefully and individually structured assignments and projects.
Restriction: Permission of ARHU-School of Theatre, Dance & Performance Studies department.
Repeatable to: 12 credits if content differs.

THET680 History of Fashion for Theatre (3 Credits)
Evolution of clothing styles and materials through history, from early Mid-Eastern civilizations to the present day.
Credit Only Granted for: THET680 or THET669A.
Formerly: THET669A.

THET688 Special Problems in Drama (3 Credits)
The preparation of adaptations and other projects in dramaturgy.

THET698 Seminar: Theatre History (3 Credits)
Studies in theatre history from classical antiquity to the present.
Prerequisite: THET391 and THET390; or students who have taken courses with comparable content may contact the department.
Recommended: THET600.
Repeatable to: 9 credits if content differs. Jointly offered w ith THET498.

THET700 Introduction to Graduate Research Methods (3 Credits)
Basic skills in theatre research.
Restriction: Must be a graduate student in a Theatre program. Also offered as: THET600.
Credit Only Granted for: THET600 or THET700.
Additional Information: Only students in the doctoral program may register for THET700.

THET711 Critical Theory (3 Credits)
A doctoral methods course. Major developments in modern and postmodern critical theory with particular emphasis on application to the fields of Theatre and Performance Studies.
Prerequisite: THET700.
Recommended: THET712.

THET712 Historical Research Methods and Historiography in Theatre (3 Credits)
A survey of methods commonly used in writing theatre history and their application to a suitable problem. Formulation of significant research questions, systematic collection of bibliographic and phenomenal information, formulating substantial claims, organizing and writing research for disciplinary outlets.
Prerequisite: THET700.
Formerly: PCOM712.

THET713 Performance Studies (3 Credits)
Introduces doctoral students to theoretical and methodological issues in performance studies. We will focus on 3 primary areas of research, analyzing representational strategies of adaptations, ethnography, and cultural analysis of theatrical performance.
Prerequisite: THET700.

THET788 Design for Live Performance Tutorial (1-6 Credits)
Collaboration with a faculty member on joint creative and artistic projects. A tutorial that assists students in developing a professional design portfolio, monitors practical production efforts and addresses practical production skills that may not be offered in traditional design studios.
Restriction: Permission of instructor.
Repeatable to: 6 credits.

THET789 Theatre Design Process and Production (1-6 Credits)
The class encompasses various areas of pedagogical interactions between MFAD students and their mentors which include, but are not limited to: design advising and supervision for mainstage design assignments and professional projects outside the School, production process supervision (shop walkthroughs, fittings, technical rehearsals, note sessions), mandatory design critiques, assisting faculty members on outside professional projects etc.
Restriction: Permission of instructor.
Repeatable to: 6 credits.

THET799 Master's Thesis Research and Preparation (1-6 Credits)
Research and preparation of the MA or MFA thesis. MA/MFA students must be registered for this class during the semester in which they defend their thesis.
Repeatable to: 6 credits.

THET888 Doctoral Practicum in Theatre (1-6 Credits)
Critical analysis of a phase of a professional field of theatre. Analysis of professional activity through personal observation. Evaluation of the purpose, process, effectiveness, and efficiency of professional activity. Recommendations for training and further research.
Repeatable to: 6 credits.

THET889 Doctoral Tutorial in Theatre and Performance Studies (1-6 Credits)
Individually designed tutorials in which a PhD student works on a creative/scholarly project requiring significant pedagogical interactions between the student and the instructor. This can include, but is not limited to, the development of an annotated bibliography in preparation for the comprehensive and qualifying examinations.
Repeatable to: 6 credits.

THET898 Pre-Candidacy Research (3-6 Credits)
Research and preparation for the Comprehensive Examinations and for the Qualifying Examinations. Students must register for at least one of these classes in each of the semesters in which these exams are taken and may register for two THET 898 courses in a semester if they are taught by different instructors. (Total credits per semester for all courses must not exceed 10 credits, 6 credits during the winter term.)
Repeatable to: 12 credits.

THET899 Doctoral Dissertation Research (1-10 Credits)
Formerly: PCOM899.

TLPL - Teaching and Learning, Policy and Leadership

TLPL401 Student-Centered Curriculum and Instruction (3 Credits)
A focus on using student-centered teaching and learning approaches in high school STEM classrooms. Students will develop and implement a multi-day series of lessons, building upon the foundations of inquiry-based practices developed in prior courses. Students will also consider the implications of cultural awareness on teaching practices broadly, as well as in the specific contexts of their fieldwork.
Prerequisite: Permission of instructor; and TLPL102; and must have completed or be concurrently enrolled in TLPL414.
Credit Only Granted for: TLPL488P or TLPL401.
Formerly: TLPL488P.
Additional Information: Field experience for this course will require students to be available for a 2-4 hour block of time at various points throughout the semester to complete observations and teach lessons between 8:00 a.m. and 3:30 p.m. A background check is required and will be facilitated through the Terrapin Teacher program coordinator.

TLPL403 Teaching and Learning High School Mathematics (3 Credits)
Methods of teaching and assessing the high school mathematics curriculum; aligning tasks and activities to curriculum standards; lesson planning; and selection and use of technology. The course also focuses on managing large group dynamics in the high school mathematics classroom.
Prerequisite: Must have 2 semesters of calculus; or permission of EDUC-Teaching and Learning, Policy and Leadership department.
Corequisite: EDCI355.
Restriction: Must be in Secondary Educ: Mathematics program; and minimum cumulative GPA of 2.75; Or permission of EDUC-Teaching and Learning, Policy and Leadership department.
Credit Only Granted for: EDCI455 or TLPL403.
Formerly: EDCI455.

TLPL406 Teaching and Learning Mathematics in the Elementary School, Part 1 (3 Credits)
Focuses on teaching and learning whole numbers. Special emphasis will be placed on developing equitable teaching practices that enable culturally and linguistically diverse students to develop knowledge and skills that promote mathematical proficiency. Mathematical concepts: Content knowledge: some aspects of early numeracy, whole numbers and the four arithmetic operations, some aspects of algebraic thinking.
Jointly offered with: TLPL607.
Credit Only Granted for: TLPL607 or TLPL406.

TLPL407 Teaching and Learning Mathematics in the Elementary School, Part 2 (3 Credits)
Focuses on teaching and learning rational numbers (fractions and decimals) and developing algebraic thinking. Special emphasis will be placed on developing equitable teaching practices that enable culturally and linguistically diverse students to develop knowledge and skills that promote mathematical proficiency. Mathematical concepts: Content knowledge: rational numbers (fractions and decimals) and the four arithmetic operations, algebraic thinking, some aspects of geometry and measurement.
Credit Only Granted for: TLPL488G or TLPL407.

TLPL413 Teaching and Learning Middle School Mathematics (3 Credits)
Methods of teaching and assessing the middle school mathematics curriculum. Understanding the conceptual difficulties students have in moving from whole numbers to rational numbers, additive thinking to multiplicative thinking, and arithmetic to algebra. Lesson planning and selection of technology and other materials are applied in the context of supervised tutoring of students having difficulty in middle school mathematics. Lab and field experience required. Supervised tutoring takes place on site at a local middle school therefore TLPL413 students will be expected to travel to a local middle school for 8-10 of the class meetings.
Restriction: Minimum cumulative GPA of 2.75; and permission of EDUC-Teaching and Learning, Policy and Leadership department.
Credit Only Granted for: EDCI457 or TLPL413.
Formerly: EDCI457.

TLPL414 Knowing and Learning in Mathematics and Science (3 Credits)
Special and intensive treatment of current topics and issues in mathematics and science teaching and learning, policy and leadership. The overall goal of the course is to orient future teachers to the discourses and theories that shape what we know about how students learn math and science.
Prerequisite: Must have completed or be concurrently enrolled in TLPL102.
Credit Only Granted for: TLPL488M or TLPL414.
Formerly: TLPL488M.

TLPL415 Perspectives in Science (3 Credits)
Overview of the history of science and philosophical perspectives on science, particularly as they apply to science teaching.
Prerequisite: Permission of instructor.
Credit Only Granted for: TLPL488W or TLPL415.
Formerly: TLPL488W.

TLPL418 Teaching Residency (3-9 Credits)
An extended teaching internship in an Elementary Professional Development School. School placements to be arranged.
Prerequisite: Must have completed or be concurrently enrolled in TLPL352, TLPL363, TLPL372, TLPL415.
Restriction: Restricted to Elementary Education majors with permission of the Department; 2.75 GPA required.
Repeatable to: 12 credits.
Credit Only Granted for: TLPL418 or EDCI481.

TLPL420 Knowledge, Reasoning, and Learning in Science (3 Credits)
For prospective science teachers. Investigations of the nature of knowledge, reasoning, and learning in middle and secondary science. Readings from cognitive science and science education research; studies of student thinking in interview and classroom observations; analyses of curricula. Includes laboratory and field experiences.
Restriction: Minimum cumulative GPA of 2.75; and permission of EDUC-Teaching and Learning, Policy and Leadership department.
Credit Only Granted for: TLPL420 or EDCI411.
Formerly: EDCI411.

TLPL421 Practices in Secondary School Science Teaching (2 Credits)
Analyses of student thinking, instructional interpretations, strategies, and techniques in the teaching internship.
Prerequisite: TLPL425.
Corequisite: EDCI471 and EDCI474.
Restriction: Permission of EDUC-Teaching and Learning, Policy and Leadership department; and must be in Secondary Educ: Science program. Or minimum cumulative GPA of 2.75.
Credit Only Granted for: TLPL421 or EDCI480.
Formerly: EDCI480.

TLPL423 Interdisciplinary Teaching in the Middle Grades I (3 Credits)
For prospective middle school teachers. Studying and planning interdisciplinary instructional practices in middle school. Utilizes context and experiences from students' field placements. Use of technology and incorporation of technology into instruction.
Prerequisite: TLPL413 and TLPL420; or permission of instructor.
Restriction: Minimum cumulative GPA of 2.75; and must be in the Middle School Teacher Education Program, major code 0804P.
Credit Only Granted for: EDCI413 or TLPL423.
Formerly: EDCI413.

TLPL424 Interdisciplinary Teaching in the Middle Grades II (3 Credits)
For prospective middle school teachers. Planning and implementing interdisciplinary instructional practices in middle school. Draws on the context of and experiences in the student teaching placement. Use of technology and incorporation of technology into instruction.
Prerequisite: TLPL423.
Corequisite: TLPL489.
Restriction: Minimum cumulative GPA of 2.75; and must be in the Middle School Teacher Education Program.
Credit Only Granted for: EDCI414 or TLPL424.
Formerly: EDCI414.

TLPL425 Learning and Teaching in Science (3 Credits)
Studies of student learning and instructional practices in science teaching.
Prerequisite: TLPL420; or permission of instructor.
Restriction: Must be in Secondary Educ: Science program.
Credit Only Granted for: EDCI470 or TLPL425.
Formerly: EDCI470.

TLPL433 Foundations of Art Education (3 Credits)
Introduction to the field of Art Education and the role of the visual arts in grades PreK-12 for today's diverse school populations. The fundamental, historical and philosophic components of art education with an emphasis on arts disciplines and curriculum. Includes a school-based practicum. For those considering art education as a major.
Restriction: Minimum cumulative GPA of 2.75.
Credit Only Granted for: EDCI403 or TLPL433.
Formerly: EDCI403.

TLPL435 Art Education Methods I (3 Credits)
Methods I provides future art teachers with a knowledge base of the theories and best practices of effective pedagogy for: teaching methods and strategies, diversity, motivational techniques, classroom management, assessment and evaluation methods, and accommodating all students including those with special needs.
Restriction: Minimum cumulative GPA of 2.75; and permission of EDUC-Teaching and Learning, Policy and Leadership department. And must be in Secondary Educ: Art program; or must be in Secondary Educ: Art pre-major program.
Credit Only Granted for: EDCI405 or TLPL435.
Formerly: EDCI405.

TLPL436 Studio Processes and Materials: 2D (3 Credits)
A discussion/studio format used to develop skills, materials, resources and education strategies for using technology and two-dimensional art in K-12 programs.
Prerequisite: ARTT210.
Restriction: Minimum cumulative GPA of 2.75; and permission of EDUC-Teaching and Learning, Policy and Leadership department; and junior standing or higher; and must not be in any of the following programs (Early Childhood Education; Elementary Education; Secondary Educ: Science; Secondary Educ: English Language Arts; Secondary Educ: Mathematics; Secondary Educ: Foreign Languages; Secondary Educ: Social Studies; Physical Education; Music Education; Special Education).
Credit Only Granted for: EDCI406 or TLPL436.
Formerly: EDCI406.

TLPL437 Studio Processes and Materials: 3D (3 Credits)
A lecture-studio course to develop skills, material resources, and educational strategies for three-dimensional projects in school settings.
Restriction: Must be in Secondary Educ: Art program; or must be a Pre-Art Education Major.
Credit Only Granted for: EDCI407 or EDCI437.
Formerly: EDCI407.

TLPL440 Foundations of Educating Multilingual Learners (3 Credits)
Investigates historical, theoretical, and public policy issues and current practice in the field of education as it relates to multilingual learners (also known as English Language Learners, English Learners) in K-12 and other settings.
Credit Only Granted for: EDCI432 or TLPL440.
Formerly: EDCI432.

TLPL441 Methods for Teaching Multilingual Learners (3 Credits)
Addresses best practices for supporting multilingual learners across academic contexts. It draws on current research regarding methods of teaching multilingual learners in PreK12 settings. Students analyze and apply classroom instruction.
Credit Only Granted for: EDCI434 or TLPL441.
Formerly: EDCI434.

TLPL442 Foundations of Literacy and Biliteracy Development (3 Credits)
An overview of the research on literacy and biliteracy development for English learners. Specifically, the course explores the theoretical models and processes of teaching reading and writing, current literacy/biliteracy issues, assessment, and strategies for developing literacy and biliteracy skills for English learners.
Credit Only Granted for: EDCI435 or TLPL442.
Formerly: EDCI435.

TLPL443 Cross-Cultural Communication and Multilingual Learners (3 Credits)
Participants will research and critically reflect upon aspects of culture as a basis to understand students and to develop principles to guide culturally inclusive teaching decisions. Participants will better understand the role of culture and language in schooling in order to create classrooms where culturally and linguistically diverse students (also known as English Language Learners, English Learners) can succeed.
Credit Only Granted for: EDCI436 or TLPL443.
Formerly: EDCI436.

TLPL444 Teaching and Understanding English Grammar with Multilingual Learners (3 Credits)
Students will analyze the major grammatical structures of American English and the role of teaching grammar and developing effective classroom methods and techniques for multilingual learners. To do so, students will be exposed to diverse theories, approaches, methods, and practical techniques of grammar instruction in order to assist multilingual learners (also known as English Language Learners, English Learners) K-12 classrooms.
Credit Only Granted for: EDCI437 or TLPL444.
Formerly: EDCI437.

TLPL445 Methods I: World Language Methods and Technology (3 Credits)
Explores Dual Language/World Language Methods and Second Language/Bilingual development. Implications for teaching and initial lesson design are explored through on-campus seminars as well as guided field experiences. Students should reserve a regular half-day per week for the field experience in local schools.
Restriction: Minimum cumulative GPA of 2.75; and permission of EDUC-Teaching and Learning, Policy and Leadership department.
Credit Only Granted for: TLPL445 or TLPL695.

TLPL446 Language Variation and Multilingualism in Elementary Classrooms (3 Credits)
Issues in language variation and multilingualism in elementary classrooms, schools and communities with a focus on classroom practice, assessment, and policy.
Restriction: Must be in Elementary Education program; and minimum cumulative GPA of 2.75. Or permission of EDUC-Teaching and Learning, Policy and Leadership department.

TLPL447 Art Education Methods II (3 Credits)
Methods II builds upon the pedagogical foundation of Methods I and provides future art teachers with the means for developing pre K-12 art lessons and unit plans for a balanced qualitative art program for today's diverse and inclusive schools and classrooms.
Prerequisite: TLPL435; or students who have taken courses with comparable content may contact the department.
Restriction: Minimum cumulative GPA of 2.75; and must be in Secondary Educ: Art program.
Credit Only Granted for: EDCI423, EDCI603, TLPL447 or TLPL633.
Formerly: EDCI423.

TLPL450 Advanced World Language Methods and Technology (3 Credits)
Teaches advanced best practices for effective world language instruction. Topics include: using authentic assessment and materials, applying national standards, teaching writing and culture, motivating students, providing strategy instruction, infusing technology, preparing for PreK-12 employment, and creating a professional portfolio.
Prerequisite: TLPL445.
Corequisite: EDCI438.
Restriction: Must be in Secondary Educ: Foreign Languages program; and minimum cumulative GPA of 2.75. Or permission of EDUC-Teaching and Learning, Policy and Leadership department.
Credit Only Granted for: EDCI433, EDCI688A, TLPL450 or TLPL696.
Formerly: EDCI433.

TLPL451 Teaching and Learning in Secondary Education: English (3 Credits)
An introduction for prospective middle and secondary English teachers into the basic issues, concepts, orientations, and processes that shape the teaching of English for diverse students in schools. Candidates explore their own perspectives in relation to local and national trends and develop basic teaching understanding and skills through on-campus seminars, teaching laboratory experiences, and guided field experiences. Students should reserve one full day or two half days per week for field experience.
Credit Only Granted for: EDCI416 or TLPL451.
Formerly: EDCI416.

TLPL452 Bases for English Language Instruction (3 Credits)
Examines current theory, research, best practice, curricula and materials focused on the teaching of English language to native and non-native English learners. Topics include morphology, syntax, semantics, vocabulary, pragmatics, argument, discourse structure, dialects, edited academic English, English language proficiency (listening, speaking, reading, writing) assessment, and instructional planning. English Language Learner (TESOL and SIOP) and special needs (inclusion) pupil issues considered.
Restriction: Must be in Secondary Educ: English Language Arts program; and minimum cumulative GPA of 2.75; and permission of EDUC-Teaching and Learning, Policy and Leadership department.
Credit Only Granted for: EDCI417 or TLPL452.
Formerly: EDCI417.

TLPL453 Life in Two Languages: Understanding Bilingual Communities and Individuals (3 Credits)
Overview of society and individual multilingualism. Topics include diglossia, language shift, codeswitching, bilingual first language acquisition, language attrition, dual language education policy and practice.

TLPL456 Teaching Writing (3 Credits)
Examines current theory, research, best practice, curricula and materials for teaching written communication in grades K-12. Focuses on analytical, argumentative, informative/explanatory, literary analysis, narrative, descriptive, and research writing. Emphasizes instructional planning, assessment, writer problem-solving strategies, information search, development, organization and style appropriate to task, purpose and audience for both non-digital and digital text. English Language Learner and special needs pupil issues considered.
Corequisite: EDCI447.
Restriction: Must be in Secondary Educ: English Language Arts program; and minimum cumulative GPA of 2.75. Or permission of EDUC-Teaching and Learning, Policy and Leadership department.
Credit Only Granted for: EDCI467 or TLPL456.
Formerly: EDCI467.

TLPL457 Literature for Adolescents (3 Credits)
Reading and analysis of fiction and nonfiction; methods for critically assessing quality and appeal; current theory and methods of instruction; research on response to literature; curriculum design and selection of books.
Restriction: Minimum cumulative GPA of 2.75; and permission of EDUC-Teaching and Learning, Policy and Leadership department.
Credit Only Granted for: EDCI466 or TLPL457.
Formerly: EDCI466.

TLPL460 Materials and Instruction for Creating Skilled and Motivated Readers, Part I (3 Credits)
Explains the educational research that addresses the acquisition of reading and its underlying processes, including research-based reading instruction and materials. Learn how to create a literacy learning environment that helps diverse learners become skilled and motivated readers through phonemic awareness, phonics, fluency, comprehension, vocabulary, and whole and small-group instructional approaches.
Restriction: Must be in Elementary Education program; and junior standing or higher. Or permission of EDUC-Teaching and Learning, Policy and Leadership department.
Credit Only Granted for: EDCI461 or TLPL460.
Formerly: EDCI461.

TLPL461 Materials and Instruction for Creating Skilled and Motivated Readers, Part II (3 Credits)
Selecting, evaluating, and using a variety of materials to create skilled and motivated readers in the elementary grades, particularly in diverse classroom settings; Topics include word analysis, spelling, writing, reading comprehension strategies, directed reading lessons, and explicit instruction.
Prerequisite: TLPL361 and TLPL460.
Corequisite: TLPL312, EDCI342, TLPL321, and TLPL362.
Restriction: Minimum cumulative GPA of 2.75; and permission of EDUC-Teaching and Learning, Policy and Leadership department; and must be in Elementary Education program.
Credit Only Granted for: EDCI462 or TLPL461.
Formerly: EDCI462.

TLPL462 Reading in the Secondary School (3 Credits)
Provides secondary school teachers with understanding the need for and approaches to teaching students to read and learn from content area texts.
Restriction: Minimum cumulative GPA of 2.75; and must be in one of the following programs (Middle School Education; Secondary Educ: Science; Secondary Educ: English Language Arts; Secondary Educ: Mathematics; Secondary Educ: Foreign Languages; Secondary Educ: Social Studies; Secondary Educ: Art) ; and permission of department required for post-baccalaureate students.
Credit Only Granted for: EDCI463 or TLPL462.
Formerly: EDCI463.

TLPL470 Knowledge, Reasoning, and Learning in Secondary Social Studies (3 Credits)
An exploration of the nature of knowledge and reasoning in social studies disciplines as well as how students learn social studies. Assessment and investigation of students' conceptions and misconceptions as well as their disciplinary thinking. Implications for teaching and initial lesson design are explored through on-campus seminars as well as guided field experiences. Students should reserve a regular half-day per week for the field experience in local schools. This course is required for admission to the secondary social studies double major.
Restriction: Permission of EDUC-Teaching and Learning, Policy and Leadership department; and minimum cumulative GPA of 2.75.
Credit Only Granted for: EDCI426 or TLPL470.
Formerly: EDCI426.

TLPL471 Curriculum, Teaching, and Assessment in Secondary Social Studies (3 Credits)
An exploration of curriculum development, teaching, and assessment in secondary history/social studies. Focus on identifying students' conceptions of social studies topics and designing lessons that advance students' disciplinary thinking and understanding.
Prerequisite: TLPL470.
Corequisite: EDCI428.
Restriction: Must be in Secondary Educ: Social Studies program; and minimum cumulative GPA of 2.75. Or permission of EDUC-Center for Learning & Educational Technology.
Credit Only Granted for: EDCI427 or TLPL471.
Formerly: EDCI427.

TLPL475 Equitable Classrooms (2 Credits)
An exploration and application of major theoretical frameworks surrounding equity and critical pedagogy. Creating habits of mind that help teachers see all students as capable of achieving at high levels. Draws on the concurrent field experience.
Prerequisite: TLPL252, TLPL413, and TLPL420.
Corequisite: EDCI360 and TLPL423.
Restriction: Minimum cumulative GPA of 2.75; and must be in Middle School Education program.
Credit Only Granted for: EDCI424 or TLPL475.
Formerly: EDCI424.

TLPL476 Equity and Pedagogy (2 Credits)
An exploration and application of major theoretical frameworks surrounding equity and critical pedagogy. Pedagogical decision making that leads to greater equity and improved student learning for all students. Draws on the concurrent student teaching experience.
Prerequisite: TLPL475.
Corequisite: TLPL424 and EDCI460.
Restriction: Minimum cumulative GPA of 2.75; and must be in one of the following programs (Middle School Education; Early Childhood Education; Elementary Education; Secondary Educ: Science; Secondary Educ: English Language Arts; Secondary Educ: Mathematics; Secondary Educ: Foreign Languages; Secondary Educ: Social Studies; Physical Education; Music Education; Secondary Educ: Art; Special Education).
Credit Only Granted for: EDCI425 or TLPL476.
Formerly: EDCI425.

TLPL477 Teaching Academically, Culturally, and Linguistically Diverse Students in Middle School and Secondary Education (2 Credits)
Instruction on methods of teaching academically, culturally, and linguistically diverse students in middle school and secondary classrooms.
Restriction: Must be in the teacher education program; or permission of EDUC-Teaching and Learning, Policy and Leadership department.
Credit Only Granted for: TLPL488B or TLPL477.
Formerly: TLPL488B.

TLPL478 Professional Seminar in Education (1-3 Credits)
Seminar on the issues and problems teacher candidates encounter in classrooms. Exploration of the skills and strategies that best address these challenges.
Restriction: Must be in a major within the EDUC-Teaching and Learning, Policy and Leadership department.
Repeatable to: 4 credits.
Formerly: EDCI488.

TLPL479 Field Experiences in Education (1-4 Credits)
Field experiences in approved eduation setting with appropriate supervision. Credit not to be granted for experience accrued prior to registration. Open only to students admitted to approved teacher education programs.
Restriction: Permission of EDUC-Teaching and Learning, Policy and Leadership department.
Repeatable to: 2 credits.
Formerly: EDCI489.

TLPL481 Embracing Diversity in the Classroom Community (3 Credits)
An exploration of the richness and complexity of student diversity that teacher candidates will encounter in PK12 classrooms. Students will engage in critical reflection around diversity and equity issues.
Restriction: Admission to teacher education program; or permission of EDUC-Teaching and Learning, Policy and Leadership department.

TLPL488 Special Topics in Education (1-3 Credits)
Special and intensive treatment of current topics and issues in teaching, learning, policy and leadership.
Restriction: Permission of EDUC-Teaching and Learning, Policy and Leadership department.
Credit Only Granted for: EDPS488 or TLPL488.
Formerly: EDPS488.

TLPL489 Internship in Education (1-12 Credits)
Internship or residency experiences in school settings with appropriate supervision. Credit not to be granted for experience accrued prior to registration. Open only to students admitted to approved teacher education programs.
Restriction: Permission of EDUC-Teaching and Learning, Policy and Leadership department.
Repeatable to: 12 credits.
Credit Only Granted for: EDPS489 or TLPL489.
Formerly: EDPS489.

TLPL498 Special Problems in Education (1-3 Credits)
Exploration of current problems in teaching, learning, policy and leadership. Available only to students who have definite plans for study of approved problems.
Restriction: Permission of EDUC-Teaching and Learning, Policy and Leadership department.
Credit Only Granted for: EDPS498 or TLPL498.
Formerly: EDPS498.

TLPL499 Workshops, Clinics, and Institutes (1-6 Credits)
The following type of educational enterprise may be scheduled under this course heading: Workshops conducted by the College of Education (or developed cooperatively with other colleges and universities) and not otherwise covered in the present course listing; clinical experiences in pupil-testing centers, reading clinics, speech therapy laboratories, and special education centers; institutes developed around specific topics or problems and intended for designated groups such as school superintendents, principals, and supervisors.
Credit Only Granted for: EDPS499 or TLPL499.
Formerly: EDPS499.

TLPL600 Teaching and Learning with Technology (3 Credits)
Provides a concrete, hands-on introduction to teaching and learning with technology. We will explore digital technology and its impact on learning and institutions. We will consider big ideas of the field as well as specific types of learning technologies and pedagogies for use in K-12 classrooms. We will discuss K-12 teaching methods that address the interdisciplinary nature of technology integration. The course will draw on class discussions, inquiry, instructional technology, and collaborative lab-based activities and prepare you to merge technology with your current teaching practice. Assessment with and of technology will also be explored.
Credit Only Granted for: EDCI687 or TLPL600.
Formerly: EDCI687.

TLPL602 Foundations of Technology in Education (3 Credits)
Provides a big-picture survey of technology in education and lays the groundwork for future coursework on the role of technology in education. This course will tackle both theoretical and practical dimensions of technology in education. After completing this course, students will have an understanding of the potential for the uses of technology for teaching and learning, identify the different roles technology can play and be ready for a hands-on introduction to specific topics/tools/pedagogies related to teaching and learning with technology.

TLPL603 Data-driven Decision Making in Schools and Classrooms (3 Credits)
Equips educators to use the data that surrounds them productively. This includes data students generate that can be used to improve student learning outcomes as well as data generated by the classroom and school that can be used to improve pedagogy and classroom culture. After completing this course, students will be better able to collect, analyze, and make decisions based on the data generated by their students and peers.

TLPL604 Teaching Science and Social Studies through Environmental Study (3 Credits)
Curriculum and instruction for science and social studies within a multicultural and environmental context; analysis of social studies and science curriculum materials; utilization of school and community resources.
Restriction: Must be in a major within the EDUC-Teaching and Learning, Policy and Leadership department.
Credit Only Granted for: EDCI695 or TLPL604.
Formerly: EDCI695.

TLPL605 Social, Cultural & Ethical Dimensions of Teaching and Learning with Technology (3 Credits)
Situates technology in the classroom within a larger social and cultural context. Along with exploring social opportunities afforded by technology, this course will cover important cultural and ethical dimensions of technology, including equity, inclusion, access, and questions of privacy and digital citizenship (for both teachers and students). After completing this course, students will be prepared to bring technology into their classrooms in responsible and safe ways while being able to take advantage of the new forms of interaction, instruction, and communication made possible through technology.

TLPL606 Teaching and Learning Mathematics in Secondary Schools (3 Credits)
Objectives, selection and organization of subject matter, appropriate methods, lesson plans, textbooks, technology and other instructional materials; assessment of student learning and other topics pertinent to secondary mathematics education. Internship of other placement in a secondary mathematics classroom is required.
Prerequisite: Enrollment in a University of Maryland program leading to teacher certification; and bachelor's degree in mathematics or related field; and 2 semesters of calculus.
Credit Only Granted for: EDCI651 or TLPL606.
Formerly: EDCI651.

TLPL607 Teaching and Learning Mathematics in the Elementary School (3 Credits)
Strategies and methodologies for the teaching of elementary school mathematics based on current research and theories about how children learn mathematics. Attention is given to professional recommendations and teaching practices that foster communication, reasoning, and reflection in the mathematics classroom. Internship or other placement in an elementary school is required.
Prerequisite: MATH212, MATH213, or MATH214; or students who have taken courses with comparable content may contact the department.
Credit Only Granted for: EDCI652 or TLPL607.
Formerly: EDCI652.

TLPL610 Trends in Mathematics Education (3 Credits)
Recent developments in educational thinking and practice which have affected the curriculum in mathematics.
Credit Only Granted for: EDCI650 or TLPL610.
Formerly: EDCI650.

TLPL611 Teaching and Learning Number in the Middle Grades (3 Credits)
Students develop reflective, theoretical perspectives toward and practical approaches for the teaching and learning of the number system in middle school. There is an emphasis on rational numbers and its pedagogical content knowledge.
Restriction: Admission to M.A or M.Ed. w/ concentration in Mathematics Education; or permission of EDUC-Teaching and Learning, Policy and Leadership department.
Credit Only Granted for: EDCI683 or TLPL611.
Formerly: EDCI683.

TLPL612 Teaching and Learning Algebra in the Middle School (3 Credits)
Designed to enhance middle school mathematics teachers' content and pedagogical knowledge in algebra.
Prerequisite: Admission to M.A. or M.Ed. with concentration in Mathematics Education; or permission of EDUC-Teaching and Learning, Policy and Leadership department.
Credit Only Granted for: EDCI655 or TLPL612.
Formerly: EDCI655.

TLPL613 Problem-Solving and Innovative Thinking in the Mathematics Classroom (3 Credits)
Curriculum and instruction for developing thinking skills through the discipline of mathematics. This is a hybrid course designed to blend on-campus class meetings with online experiences.
Prerequisite: Experience teaching mathematics K-12. And TLPL312; or TLPL413; or students who have taken courses with comparable content may contact the department.
Credit Only Granted for: EDCI653 or TLPL613.
Formerly: EDCI653.

TLPL614 Assessing Mathematical Understanding (3 Credits)
Techniques of assessing k-12 students' understanding of mathematics - including standardized tests, but focusing on alternative forms such as individual interviews, writing tasks, performance tasks, portfolios. Mathematics assessment viewed as an ongoing part of instruction.
Prerequisite: TLPL610; or permission of EDUC-Teaching and Learning, Policy and Leadership department.
Credit Only Granted for: EDCI654 or TLPL614.
Formerly: EDCI654.

TLPL615 Teaching and Learning Geometry in the Middle Grades (3 Credits)
Designed to enhance both the pedagogical and geometric content knowledg of middle school mathematics teachers.
Prerequisite: Admission to M.A. or M.Ed. with concentration in Mathematics Education; or permission of EDUC-Teaching and Learning, Policy and Leadership department.
Credit Only Granted for: EDCI645 or TLPL615.
Formerly: EDCI645.

TLPL616 Teaching and Learning Statistics in the Middle School (3 Credits)
Designed to enhance both the pedagogical and statistical/data analysis content knowledge of middle school mathematics teachers.
Prerequisite: Admission to M.Ed. or M.A. program in EDCI with concentration in Mathematical Education.
Credit Only Granted for: EDCI656 or TLPL616.
Formerly: EDCI656.

TLPL617 Understanding and Engaging Students' Conceptions of Mathematics (3 Credits)
Research related to K-14 students' common errors in and (mis)understandings of mathematics. Instructional strategies useful in building on errors and changing students' conceptions.
Prerequisite: Experience in teaching math; or permission of EDUC-Teaching and Learning, Policy and Leadership department.
Credit Only Granted for: EDCI657 or TLPL617.
Formerly: EDCI657.

TLPL618 Digital Learning Tools and Communities (1 Credit)
Addresses the student learning outcomes outlined by the Interstate Teacher Assessment and Support Consortium(InTASC). When this course is successfully completed, students will be able to competently integrate technology into instruction to support student learning and develop research-based strategies for instructional and school improvement. Students are expected to demonstrate proficiency in each of the seven Maryland Teacher Technology Standards as well as the International Society for Technology Educator Standards.
Restriction: Must be in a Master of Education Teacher Certification Program.
Repeatable to: 3 credits.

TLPL621 Learning and Teaching in the Physical Sciences I (3 Credits)
Engagement in laboratory and inquiry-based methods to develop coherent understandings about the physical world and explore issues in the physical sciences. Personal engagements with phenomena and reflection on the learning and instructional experiences.
Restriction: Enrollment in an EDCI Outreach Program in science education; or must be in Curriculum and Instruction (Master's) program; or permission of instructor.
Credit Only Granted for: EDCI604 or TLPL621.
Formerly: EDCI604.

TLPL623 Learning and Teaching Biological Sciences (3 Credits)
Engagement in laboratory and inquiry-based methods to develop coherent understandings about the natural world and explore issues learning in biology. Personal engagement with phenomena and reflection on the learning and instructional experiences.
Restriction: Enrollment in an EDCI Outreach Program in science education; or must be in Curriculum and Instruction (Master's) program; or permission of instructor.
Credit Only Granted for: EDCI606 or TLPL623.
Formerly: EDCI606.

TLPL625 Teaching Science in Elementary Schools (3 Credits)
Identification of problems in teaching science. Methods for improving the effectiveness of science education.
Credit Only Granted for: EDCI671 or TLPL625.
Formerly: EDCI671.

TLPL626 Learning to Teach and Learn Science (3 Credits)
Developing practices of instruction in science teaching in the context of understanding student science learning.
Prerequisite: TLPL420; or permission of EDUC-Teaching and Learning, Policy and Leadership department.
Restriction: Must be in the Maryland Master's Certification program; or permission of EDUC-Teaching and Learning, Policy and Leadership department.
Credit Only Granted for: EDCI675 or TLPL626.
Formerly: EDCI675.

TLPL630 Trends in Art Education Curriculum (3 Credits)
Recent developments in art education.
Credit Only Granted for: EDCI600 or TLPL630.
Formerly: EDCI600.

TLPL631 Historical Foundations of the Arts in Education (3 Credits)
An investigation into major historical events and underlying beliefs, values and practices that influence contemporary arts education (visual art, drama, dance, music) at all levels of instruction. Selected literature that focuses on cultural contexts, individuals, institutions, events and national and international perspectives is used to investigate changing conceptions and practices of arts education.
Credit Only Granted for: EDCI601 or TLPL631.
Formerly: EDCI601.

TLPL632 Understanding and Teaching Aesthetics (3 Credits)
Critical investigation of art, and curriculum implications.
Credit Only Granted for: EDCI602 or TLPL632.
Formerly: EDCI602.

TLPL633 Integrated Art Methods (3 Credits)
Builds upon the pedagogical foundation of an initial art education methods course and provides future art teachers with the means for developing PreK-12 art lesson/unit plans for a balanced qualitative art program for today's diverse and inclusive schools/classrooms. Integratin g art with other subject areas.
Prerequisite: EDCI680; or TLPL435.
Restriction: Must be in a major within the EDUC-Teaching and Learning, Policy and Leadership department.
Credit Only Granted for: EDCI423, EDCI603, TLPL447 or TLPL633.
Formerly: EDCI603.

TLPL634 Teaching Language Arts in Elementary Schools (3 Credits)
Analysis of current issues, trends, and problems in language-arts instruction.
Credit Only Granted for: EDCI643 or TLPL634.
Formerly: EDCI643.

TLPL635 Coaching and Mentoring Teachers: Literacy Across Content Areas (3 Credits)
Provides knowledge on coaching and mentoring teachers in school distric and school settings based on Standards for Middle and High School Literacy Coaches as well as current theory, research and best practice supporting the efficacy of literacy coaching. Emphasis on understanding reading process/strategy instruction; writing process/ strategy instruction; and gathering and interpreting valid and reliable assessment data for creating district-wide and school-based literacy intervention plans.
Prerequisite: Enrolled in EDCI post-baccalaureate certificate Program in Literacy coaching.
Restriction: Must be in Curriculum and Instruction (Master's) program; and permission of instructor.
Credit Only Granted for: EDCI646 or TLPL635.
Formerly: EDCI646.

TLPL636 Trends in Secondary School Curriculum: English (3 Credits)
Recent developments in educational thinking and practice on the curriculum in English education.
Credit Only Granted for: EDCI640 or TLPL636.
Formerly: EDCI640.

TLPL637 Teaching for Equity in Bilingual/Dual Language Immersion Programs (3 Credits)
Focuses on how educators apply and reflect on teaching, learning and school practices aimed to achieve educational equity in dual language programs, including bilingual, two way, and one-way immersion K-12. This course will include instruction, discussion, and materials in a LOTE (Language other than English) to model bilingual instruction.

TLPL640 Assessing, Diagnosing, and Teaching Writing (3 Credits)
Examines current theory, research, best practice, curricula and materials for teaching written communication in middle and secondary schools in order to survey, review and select formal and informal assessments and diagnostic strategies useful for writing teachers. Focuses on validity and reliability issues. Includes instructional planning and development of instructional materials for implementing appropriate individual, small-group and large-group instruction. English Language Learner (TESOL and SIOP) and special needs (inclusion) pupil issues considered.
Restriction: Permission of EDUC-Teaching and Learning, Policy and Leadership department.
Credit Only Granted for: EDCI673 or TLPL640.
Formerly: EDCI673.

TLPL641 Reading, Cognition, and Instruction: Reading in the Content Areas I (3 Credits)
Provides middle and secondary education students with an understanding of the interactive nature of the reading process, the use of research-based instructional strategies, the relationship between vocabulary development and student concept development, the design of strategic reading instruction, the methods for assessing content area literacy, and the ability to plan instruction and communicate with students, parents, and allied professionals.
Credit Only Granted for: EDCI625 or TLPL641.
Formerly: EDCI625.

TLPL642 Processes and Acquisition of Writing (3 Credits)
Focuses on theory around the social nature of oral and written language. Specifically, reading like a writer (mentor texts, modeling, etc.), accountable talk (talk that supports writing discussion, question posing, etc.), and feedback (peer review, editing, writing for an audience, community of writers, etc.). Through these three focus areas, the teaching and assessment practices of 21st-century multimodal literacies will be addressed.
Restriction: For Master's Certification Students only; or permission of EDUC-Teaching and Learning, Policy and Leadership department.
Credit Only Granted for: EDCI626 or TLPL642.
Formerly: EDCI626.

TLPL643 Assessing Student Learning and Development (3 Credits)
Prepares experienced teachers to assess student knowledge, strategies and skills over time so that they can design instruction that builds on student strengths and addresses student needs. Teachers will study the purposes of assessment including school and student needs. Teachers will study the purposes of assessment including school and teacher accountability, student placement, course grade assignment and instructional design. They also will explore types of formal and informal assessment, curriculum-based and curriculum-free assessment, external and teacher made assessment.
Credit Only Granted for: EDCI612 or TLPL643.
Formerly: EDCI612.

TLPL644 Foundations of Reading (3 Credits)
Broad and comprehensive overview of reading and literacy and factors that may influence effective reading practices such as instruction, classroom environment and individual differences. Focus on different knowledge domains and traditions of inquiry related to reading and reading instruction.
Prerequisite: EDCI362; or TLPL462; or students who have taken courses with comparable content may contact the department.
Credit Only Granted for: EDCI660 or TLPL644.
Formerly: EDCI660.

TLPL645 Content Area Reading (3 Credits)
Research-based strategies for improving reading to learn in the content areas (K-12).
Prerequisite: EDCI362; or TLPL462; or students who have taken courses with comparable content may contact the department.
Credit Only Granted for: EDCI661 or TLPL645.
Formerly: EDCI661.

TLPL646 Linguistics in Education (3 Credits)
Provides teachers and educational researchers with the theoretical and technical knowledge of linguistics necessary to engage effectively in their fields.

TLPL647 Diagnostic Reading Assessment and Instruction (3 Credits)
Prepares individuals to be proficient, classroom-based assessors of student literacy learning and development by examining literacy assessment theory, materials, and procedures and the use of assessment to inform instruction.
Restriction: Permission of EDUC-Teaching and Learning, Policy and Leadership department.
Credit Only Granted for: EDCI662 or TLPL647.
Formerly: EDCI662.

TLPL651 Leadership in Schoolwide Reading Program (3 Credits)
Preparation of reading personnel to function as resource persons to classroom teachers, administrators and the school community.
Restriction: Permission of EDUC-Teaching and Learning, Policy and Leadership department.
Credit Only Granted for: EDCI666 or TLPL651.
Formerly: EDCI666.

TLPL652 Multicultural Materials and Instruction for P-12 Readers (3 Credits)
An exploration of the multicultural materials and instructional strategies that create responsive P-12 classrooms and curricula for diverse readers.
Credit Only Granted for: TLPL652 or EDCI667.
Formerly: EDCI667.

TLPL653 Clinical Assessment in Reading (3 Credits)
Clinical diagnostic techniques and materials for assessing reading strengths and needs.
Prerequisite: TLPL645 and TLPL650; or permission of EDUC-Teaching and Learning, Policy and Leadership department.
Credit Only Granted for: EDCI664 or TLPL653.
Formerly: EDCI664.

TLPL654 Clinical Instruction in Reading (3 Credits)
Clinical procedures and materials for reading instruction.
Prerequisite: TLPL653; or permission of EDUC-Teaching and Learning, Policy and Leadership department.
Credit Only Granted for: EDCI665 or TLPL654.
Formerly: EDCI665.

TLPL655 Assessment and Language Education (3 Credits)
Participants view current school-based assessments through varied models of assessment focusing on how schools measure language and achievement for multilingual learners (also known as English Language Learners, English Learners). Participants will identify the purpose, instrument, method, and the use of assessments and evaluations most appropriate and valid for multilingual students.
Credit Only Granted for: EDCI631 or TLPL655.
Formerly: EDCI631.

TLPL656 Teaching Culturally and Linguistically Diverse Exceptional Learners (3 Credits)
Explores cross-cultural and linguistic diversity as they relate to identification procedures for and education of English learners with exceptional needs beyond the second language acquisition process such as learning disabilities and gifted & talented.
Credit Only Granted for: EDCI632 or TLPL656.
Formerly: EDCI632.

TLPL657 Cross-Cultural Communication and Multilingual Learners (3 Credits)
Participants will research and critically reflect upon aspects of culture as a basis to understand students and to develop principles to guide culturally inclusive teaching decisions. Participants will better understand the role of culture and language in schooling in order to create classrooms where culturally and linguistically diverse students (also known as English Language Learners, English Learners) can succeed.
Credit Only Granted for: EDCI633 or TLPL657.
Formerly: EDCI633.

TLPL660 Foundations of Literacy and Biliteracy Development (3 Credits)
An overview of the research on literacy and biliteracy development for English learners. Specifically, the course explores the theoretical models and processes of teaching reading and writing, current literacy/biliteracy issues, assessment, and strategies for developing literacy and biliteracy skills for English learners.
Prerequisite: TLPL665.
Credit Only Granted for: EDCI636 or TLPL660.
Formerly: EDCI636.

TLPL661 Multiliteracies: Theory and Practice (3 Credits)
Explores the theoretical constructs and practical manifestations of multiliteracies in communities and schools by presenting an overview of the research on the constructs of New Literacy Studies, Critical Literacy, Digital Literacy, and Funds of Knowledge, as well as the practical implications of teaching reading and writing to culturally and linguistically diverse learners in content areas (i.e., language arts, math, science, social studies, etc.) in classrooms.
Prerequisite: TLPL665.
Credit Only Granted for: EDCI638, EDCI688J, or TLPL661.
Formerly: EDCI638 and EDCI688J.

TLPL662 Second Language Acquisition (3 Credits)
Major theoretical approaches to second language acquisition. For teaching English to speakers of other languages (TESOL).
Restriction: Permission of EDUC-Teaching and Learning, Policy and Leadership department.
Credit Only Granted for: EDCI732 or TLPL662.
Formerly: EDCI732.

TLPL663 Practice and Theory in Teaching Second Language Learners (3 Credits)
Focuses on issues that arise while teaching second language (ESOL or foreign language) learners. Supports implementation of theory into practice and research-based best practices during teaching internship, and completion of teaching portfolio during a second field experience.
Corequisite: EDCI637 or EDCI689; or permission of EDUC-Teaching and Learning, Policy and Leadership department.
Credit Only Granted for: EDCI613 or TLPL663.
Formerly: EDCI613.

TLPL664 Foundations of Second Language Education: Legal, Social and Historical Trends and Issues (3 Credits)
Knowledge of history, research, current practice and public policy issues in the field of second languague education from kindergarten to post-secondary settings. Required for TESOL certification program.
Credit Only Granted for: EDCI630 or TLPL664.
Formerly: EDCI630.

TLPL665 Methods for Teaching Multilingual Learners (3 Credits)
Draws on current research to present methods of teaching English to speakers of other languages and challenges participants to analyze and apply successful classroom practices that address the needs of culturally and linguistically diverse learners (also known as English Language Learners, English Learners).
Credit Only Granted for: EDCI634 or TLPL665.
Formerly: EDCI634.

TLPL666 English Grammar for Teachers of English to Speakers of Other Languages (3 Credits)
English grammar and methods of teaching grammar for graduate, prospective and current teachers of English to speakers of other languages. Analysis of the major grammatical structures of American English. Discussion of the role of teaching grammar, and effective classroom methods and techniques for the English as a second/foreign language classroom.
Restriction: Permission of EDUC-Teaching and Learning, Policy and Leadership department.
Credit Only Granted for: EDCI635 or TLPL666.
Formerly: EDCI635.

TLPL667 Teaching Multilingual Learners- Culturally Sustaining & Translanguaging Practices in Literacy Classrooms (3 Credits)
Focuses on methods and materials for teaching reading and literacy to English learners/multilingual learners in various instructional settings.

TLPL668 Developing a Professional Portfolio (1-3 Credits)
Students will examine issues of performance assessment and develop professional portfolios following the guidelines established by the National Board of Professional Teaching Standards. Drawing on the research data collected throughout their program and relying on inquiry, reflections, and analysis, they will synthesize and present the body of their teaching experience.
Repeatable to: 3 credits.
Credit Only Granted for: EDCI614, EDCI619 or TLPL668.
Formerly: EDCI614.

TLPL670 Economics of Education (3 Credits)
An introduction to the application of economic principles to the study of education policy. The course content revolves around issues of efficiency, equity, and freedom of choice. Specific attention is devoted to school finance litigation and reform, practices for raising and allocating resources, and education productivity issues.
Credit Only Granted for: EDPS615 or TLPL670.
Formerly: EDPS615.

TLPL671 Education Policy Analysis (3 Credits)
Policy making in education from planning to evaluation with emphasis on the identification of policy problems and the resources available to analysts through multi-disciplinary approaches. An introductory experience with education policy analysis.
Credit Only Granted for: EDPS620 or TLPL671.
Formerly: EDPS620.

TLPL673 Federal Education Policy (3 Credits)
Federal involvement in education in the United States from 1780 to the present, emphasizing the effects of legislation, court decisions, agencies, and presidential initiatives on the distribution of education opportunities.
Credit Only Granted for: TLPL673 or EDPS625.
Formerly: EDPS625.

TLPL674 Studying Student Learning in Diverse Settings (3 Credits)
This course deepens teacher understanding of student development and th cultural context for teaching through readings and focused field studies. Participants will also begin developing skills needed for investigations using methods of interpretive inquiry.
Credit Only Granted for: EDCI611 or TLPL674.
Formerly: EDCI611.

TLPL675 Embracing Diversity in Classroom Communities (3 Credits)
The course aims to help students understand race, class, gender, and sexuality as systems of privilege, exclusion, marginalization, and the centrality of embracing diversity in the classroom communities to promote the success of all students.
Credit Only Granted for: EDCI697 or TLPL675.
Formerly: EDCI697.

TLPL676 Teaching as a Profession (3 Credits)
The profession of teaching and the knowledge base that defines teaching. Current and social issues that affect teaching and learning; role of research and experience in learning to teach.
Restriction: Permission of EDUC-Teaching and Learning, Policy and Leadership department.
Credit Only Granted for: EDCI690 or TLPL676.
Formerly: EDCI690.

TLPL677 Reframing Teacher Professionalism: Achieving Teacher Leadership (3 Credits)
Understanding the profession of teaching, teacher leadership, and the knowledge base that undergirds the teaching profession. Multiple perspectives on teaching in the current debate on school reform and how they are aligned across the political spectrum.
Credit Only Granted for: EDCI682 or TLPL677.
Formerly: EDCI682.

TLPL678 Professional Seminar in Education (1-3 Credits)
Seminar on the issues and problems teacher candidates encounter in classrooms. Exploration of the skills and strategies that best address these challenges.
Prerequisite: Admission to a masters certification program in EDCI.
Corequisite: Participation in an arranged school placement.
Credit Only Granted for: EDCI618 or TLPL678.
Formerly: EDCI618.

TLPL679 Field Experiences in Education (1-3 Credits)
Field experiences in approved educational setting with appropriate supervision. Credit not to be granted for experience accrued prior to registration. Open only to students admitted to approved teacher education programs.
Repeatable to: 3 credits if content differs.
Formerly: EDPS689.

TLPL680 Foundations of Education (3 Credits)
An examination of the history and impact of US schools, with emphasis on how schools could achieve the promise of a high-quality, world-class education for the students they serve.
Credit Only Granted for: TLPL688B or TLPL680.
Formerly: TLPL688B.

TLPL681 History of Education in the United States (3 Credits)
A study of the origins and development of education in the United States, emphasizing the variety of interpretive and methodological concerns that define the field.
Credit Only Granted for: TLPL681 or EDPS611.
Formerly: EDPS611.

TLPL682 Philosophy of Education (3 Credits)
A study of the great educational philosophers and systems of thought affecting the development of modern education, with particular emphasis on recent scholarship on philosophical problems in education.
Credit Only Granted for: EDPS612 or TLPL682.
Formerly: EDPS612.

TLPL683 Sociology of Education (3 Credits)
This seminar examines major theoretical frameworks and perspectives of the sociology of education with an emphasis on k-12 education. The course also takes a pragmatic approach by applying theoretical knowledge to understand U.S. schooling and contemporary educational themes and debates where activists, researchers, and political actors aim to alter schools, students, or families.
Credit Only Granted for: TLPL683 or EDPS613.
Formerly: EDPS613.

TLPL685 Teaching Social Studies in Elementary Schools (3 Credits)
Examination of current literature and research in the social sciences as they relate to social studies curriculum and instruction.
Credit Only Granted for: EDCI622 or TLPL685.
Formerly: EDCI622.

TLPL686 Curriculum, Teaching and Assessment in Social Studies (3 Credits)
Focuses on five key issues on social studies education: defining learning goals, building units with aligned goals, assessments, and instructional activities, designing inquiry-based lessons, assessing student learning, and modifying instruction based on assessment data.
Prerequisite: TLPL470; or EDCI680.
Credit Only Granted for: EDCI627 or TLPL686.
Formerly: EDCI627.

TLPL687 Politics of Education (3 Credits)
Educational institutions as political entities. Focuses on conceptual perspectives for examining political dynamics in governmental and organizational contexts. Provides opportunities to carry out original case studies of policy making processes at various levels of the education policy system.
Credit Only Granted for: EDPS614 or TLPL687.
Formerly: EDPL614.

TLPL688 Special Topics in Education (1-3 Credits)
Special treatment of current topics and issues in teaching, learning, policy and leadership.
Restriction: Permission of EDUC-Teaching and Learning, Policy and Leadership department.
Formerly: EDCI688.

TLPL689 Internship in Education (1-12 Credits)
Internship or residency experiences in school settings with appropriate supervision. Credit not to be granted for experience accrued prior to registration. Open only to students admitted to approved teacher education programs.
Restriction: Permission of EDUC-Teaching and Learning, Policy and Leadership department.
Repeatable to: 12 credits if content differs.
Credit Only Granted for: EDCI689 or TLPL689.
Formerly: EDCI689.

TLPL690 Critical Literacies, Digital Technology & Instruction for Diverse Classrooms (3 Credits)
Focuses on issues related to critical literacy, digital technology, and literacy instruction, including the impact of media and various technologies on teachers and students.

TLPL691 Research Methods (3 Credits)
The interpretation and conduct of research relevant to curriculum, teaching and learning.
Credit Only Granted for: EDCI685 or TLPL691.
Formerly: EDCI685.

TLPL692 Statistical Literacy for Education Research (3 Credits)
Students will learn about descriptive (measures of central tendencies and dispersion) and inferential (bivariate and OLS regression) statistics with education applications. Throughout the course, students will learn critical basic statistical concepts, and statistics' language and how to interpret results and communicate research findings, both orally and in written form. Students will also explore various statistical techniques and read research articles to better understand statistical procedures and approaches.
Credit Only Granted for: TLPL788C, EDPS788I or TLPL692.
Formerly: TLPL788C.

TLPL694 Embracing Diversity: Critical Foundations of Schooling and Education (3 Credits)
Introduces teacher candidates to critical, sociocultural foundations of U.S. schooling, education, and society. Teacher candidates interrogate what it means to be an anti-racist, social justice-oriented educator in a pluralistic classroom.

TLPL695 Methods I: World Language Methods and Technology (3 Credits)
The first of two sequential courses required for achieving competence in teaching a world language. Explores Dual Language/World Language Methods and Second Language/Bilingual development. Implications for teaching and initial lesson design are explored through on-campus seminars as well as guided field experiences. Students should reserve a regular half-day per week for the field experience in local schools.
Credit Only Granted for: TLPL445 or TLPL695.
Additional Information: Lab and field experiences required.

TLPL696 Advanced World Language Methods and Technology (3 Credits)
Teaches advanced best practices for effective World Language instruction. Topics include: lesson planning, using authentic assessment and materials, applying national and state standards infusing culture, interdisciplinary content and technology. Classroom management procedures and strategies to create a welcoming and engaging classroom environment. Motivating students and differentiated instruction.
Prerequisite: TLPL695; and TLPL695.
Corequisite: Must be concurrently enrolled in TLPL479J.
Credit Only Granted for: EDCI433, EDCI688A, TLPL450 or TLPL696.
Formerly: EDCI688A.

TLPL697 Embracing Diversity: Supporting Culturally and Linguistically Diverse Learners in the Secondary Classrooms (3 Credits)
Explores language variation across a wide range of social, economic, regional and ethnic groups. It is designed to help teacher candidates increase their awareness of language differences and to enhance their effectiveness when teaching in culturally and linguistically diverse secondary classrooms.
Credit Only Granted for: TLPL688G or TLPL697.
Formerly: TLPL688G.

TLPL698 Conducting Research on Teaching (1-3 Credits)
Analysis and improvement of educational practice. Research methods used in the study of classroom teaching. Design and conduct of an action research project. Open only to students admitted to approved teacher education programs.
Restriction: Permission of EDUC-Teaching and Learning, Policy and Leadership department.
Repeatable to: 3 credits if content differs.
Formerly: EDCI698.

TLPL699 Master's Seminar (3 Credits)
Directed study for master's degree students writing seminar papers.
Credit Only Granted for: EDPS679 or TLPL699.
Formerly: EDPS679.

TLPL700 Theory and Research in Computer Education (3 Credits)
Examination of the current research and theory in the instructional uses of computers, instructional tutoring systems, computer programing environments, computer-based laboratories and problem solving environments in educational settings.
Prerequisite: TLPL600, EDMS645, and TLPL691; or permission of EDUC-Teaching and Learning, Policy and Leadership department.
Credit Only Granted for: EDCI783 or TLPL700.
Formerly: EDCI783.

TLPL701 Computers in Science Education (3 Credits)
Current and projected methods by which computers can augment classroom and laboratory-based science instruction in school and non-school settings.
Prerequisite: Must have completed EDCI487; or students who have taken courses with comparable content may contact the department.
Credit Only Granted for: EDCI677 or TLPL701.
Formerly: EDCI677.

TLPL702 Theories of Learning and Leadership with Technology (3 Credits)
Exploration of the impact technology has on how people learn,and how people use technology effectively to facilitate learning. Discussion of theories of designing technology for effective teaching and learning, and examinations of the challenges of implementing technology in education systems.
Credit Only Granted for: EDCI788Q or TLPL702.
Formerly: EDCI788Q.
Additional Information: Priority will be given to students in the Technology Learning and Leadership specialization.

TLPL703 Research on Technology in Education (3 Credits)
Students explore the research methodologies used by those doing research with and on learning technologies, focusing on cultural, experimental, design and learning analytic approaches. Emphasis will be on asking meaningful research questions related to technology and exploring methodological and analytical approaches for answering them. This course will also explore research methods that examine the efficacy of new technologies, research about technology, design methods.
Credit Only Granted for: EDCI788Q or TLPL703.
Formerly: EDCI788Q.
Additional Information: Priority will be given to students in the Technology Learning and Leadership specialization.

TLPL704 Research Methodologies and Educational Practice (3 Credits)
Introduction to methodological approaches commonly used in educational research with a focus on addressing issues in teaching and learning, schools and communities, and educational policy.
Restriction: Must be in Teaching and Learning, Policy and Leadership Master of Arts program; or permission of instructor.
Credit Only Granted for: TLPL788W or TLPL704.
Formerly: TLPL788W.

TLPL708 Special Topics in Technology, Learning & Leadership (1-3 Credits)
Read, plan, conduct, and report on research projects and research topics related to Technology, Learning & Leadership. Projects may be faculty/student projects, or group or individual student projects (may or may not be related to a dissertation). Emphasis on framing researchable questions and designing/analyzing research studies. Faculty and peer feedback and interaction are crucial expectations.
Repeatable to: 9 credits if content differs.
Credit Only Granted for: EDCI758, TLPL728 or TLPL708.
Formerly: EDCI758, TLPL728.

TLPL710 Theory and Research on Mathematical and Scientific Thinking and Learning (3 Credits)
Study of mathematical and scientific thinking by students at various levels of schooling considered from the perspective of those classic and contemporary theories of learning that are particularly relevant to the study of mathematics and science. Exploration of what it means to understand mathematics and science.
Prerequisite: Admitted to Doctoral Program in Mathematics Education or Science Education; or permission of EDUC-Teaching and Learning, Policy and Leadership department.
Credit Only Granted for: EDCI751 or TLPL710.
Formerly: EDCI751.

TLPL711 Foundations of Mathematics Education II: Theory and Research on Mathematics Teaching (3 Credits)
Knowledge of and insights into how mathematics has been and is being taught; theories about how it might be taught. Familiarity with the methods used to do research on teaching and to improve teaching.
Prerequisite: TLPL710; or permission of EDUC-Teaching and Learning, Policy and Leadership department.
Credit Only Granted for: EDCI752 or TLPL711.
Formerly: EDC752.

TLPL712 Foundations of Mathematics Education III: Curriculum (3 Credits)
The study of curriculum in mathematics and research on curriculum. The relationship of mathematics and school mathematics; the forms, purposes,development, and evaluation of mathematics curricula.
Prerequisite: Admitted to Mathematics Education Doctoral Program; or permission of EDUC-Teaching and Learning, Policy and Leadership department.
Credit Only Granted for: EDCI753 or TLPL712.
Formerly: EDCI753.

TLPL713 Mathematics and Science Education Policy, Professional Development and Teacher Preparation (3 Credits)
Preservice teacher education, professional development, and policy as agents of reform in mathematics education and in science education.
Prerequisite: Admitted to Doctoral Program in Mathematics Education or Science Education; or permission of EDUC-Teaching and Learning, Policy and Leadership department.
Credit Only Granted for: EDCI754 or TLPL713.
Formerly: EDCI754.

TLPL720 Foundations of Science Education (3 Credits)
Development of science education pre-kindergarten through college; the influences on current and future practices; and the identification and critical analysis of topics in science education.
Prerequisite: TLPL620 or TLPL625; or permission of EDUC-Teaching and Learning, Policy and Leadership department.
Credit Only Granted for: EDCI770 or TLPL720.
Formerly: EDCI770.

TLPL728 Research Seminar in Mathematics and Science Education (1 Credit)
Read, plan, conduct, and report on research projects and research topics in mathematics and science education. Projects may be faculty/student projects, or group or individual student projects (may or may not be related to a dissertation). Emphasis on framing researchable questions and designing/analyzing research studies. Faculty and peer feedback and interaction are crucial expectations.
Prerequisite: Admission to Doctoral Program in Mathematics or Science Education; and must have completed or be concurrently enrolled in TLPL710 or TLPL713.
Repeatable to: 9 credits if content differs.
Credit Only Granted for: EDCI758 or TLPL728.
Formerly: EDCI758.

TLPL730 Theory and Research in English Education (3 Credits)
A survey of the research literature; evaluation of research techniques; consideration of relevant instructional curriculum theory; evaluation of modern teaching methods and techniques.
Credit Only Granted for: EDCI740 or TLPL730.
Formerly: EDCI740.

TLPL731 Theory and Research in Written Communication (3 Credits)
Analysis and synthesis of recent theoretical trends in writing research; the reading and critiquing of representative research studies. The study of research methods for conducting disciplined inquiry in written communication.
Recommended: TLPL691.
Credit Only Granted for: EDCI745 or TLPL731.
Formerly: EDCI745.

TLPL732 Writing Across the Curriculum (3 Credits)
Emphasis on providing secondary education majors with an interdisciplinary foundation in current theory, research, and best practice focused on the teaching of writing across the curriculum, e.g.,art, English, foreign languages and TESOL, language arts, mathematics, music, sciences, and social studies. Exceptional student, inclusion, and diversity issues w ill be discussed.
Credit Only Granted for: EDCI764 or TLPL732.
Formerly: EDCI764.

TLPL733 Advanced Clinical Practices in Reading Assessment (3 Credits)
Clinical practicum in assessment focusing on strengths and needs in reading. Case report writing and conferences.
Prerequisite: TLPL654.
Corequisite: TLPL734.
Credit Only Granted for: EDCI761 or TLPL733.
Formerly: EDCI761.

TLPL734 Advanced Clinical Practices in Reading Instruction (3 Credits)
Clinical practicum in instruction focusing on instructional techniques and diagnostic teaching.
Prerequisite: TLPL654.
Corequisite: TLPL733.
Credit Only Granted for: EDCI762 or TLPL734.
Formerly: EDCI762.

TLPL738 Theory and Research in Reading (3 Credits)
Survey of the literature in reading and allied fields, and an examination of current research trends and methodologies.
Restriction: Permission of EDUC-Teaching and Learning, Policy and Leadership department.
Repeatable to: 6 credits if content differs.
Formerly: EDCI769.

TLPL740 Language and Education (3 Credits)
Dialect, language varieties in school settings; historical and current perspectives on the role of language in learning; theories of school achievement and consequences for language assessment.
Credit Only Granted for: EDCI730 or TLPL740.
Formerly: EDCI730.

TLPL743 Teaching Multilingual Learners: Current and Future Research Directions in Applied Linguistics and Language Education (3 Credits)
Examines the research base on teacher education through an equity-oriented lens, asking the larger question: How can we prepare teachers of multilingual learners to engage in humanizing and asset-oriented pedagogies? It also explores opportunities for future research in teacher education.
Credit Only Granted for: EDCI734 or TLPL743.
Formerly: EDCI734.

TLPL744 Research Centering Multilingual Learners: Sociocultural Approaches to Applied Linguistics in Education (3 Credits)
Critically examine research relevant to multilingual students, bilingual education, and theories of second language acquisition and multilingual development. Students will apply sociocultural perspectives to understand educational contexts and practices that can lead to greater educational equity for culturally and linguistically diverse students.

TLPL745 Classroom Inquiry Toward Teacher Professional Development (3 Credits)
Explores theories, models, and strategies for effective literacy coaching, leadership, and teacher growth. Focuses on coaching roles, cycles, inquiry, and challenges to improve instruction and support diverse learners.

TLPL746 Leading Literacy: Coaching for Struggling Readers and Writers (3 Credits)
Prepares future literacy coaches to support struggling readers and writers using evidence-based strategies aligned with the Science of Reading. Students will explore assessment tools, intervention models, and instructional coaching practices. Emphasis will be placed on coaching practices within (multi-tiered system of supports) MTSS frameworks, phonics and decoding interventions, written expression strategies, and literacy equity.

TLPL757 Conservative Educational Thought (3 Credits)
An introduction to conservative educational ideas, expressed through a diverse group of thinkers and applied to a range of policy issues, including decentralization, pluralism, parents' rights, community, virtue, and public authority.
Credit Only Granted for: TLPL757, TLPL788N or TLPL788B.
Formerly: TLPL788N and TLPL788B.

TLPL760 College Teaching (3 Credits)
Critical review of literature on teaching in higher education from conceptual and practical viewpoints. Designed for current and prospective adult educators. Focused on research and improvement of instruction.
Credit Only Granted for: EDPS757 or TLPL760.
Formerly: EDPS757.

TLPL761 History of Curriculum Theory and Development (3 Credits)
The writings of major educators in curriculum. Conceptual and formal similarities and differences between current curriculum projects and historical antecedents. Survey of curriculum materials for classroom use in their relationship to the curriculum theory of their time.
Prerequisite: TLPL693.
Restriction: Permission of EDUC-Education Policy and Leadership department.
Credit Only Granted for: EDPS732 or TLPL761.
Formerly: EDPS732.

TLPL762 Phenomenological Inquiry I (3 Credits)
Philosophic grounding for phenomenological inquiry at a beginning level Guided writing practice in doing phenomenological inquiry is provided on a selected lived experience phenomenon.
Credit Only Granted for: EDPS735 or TLPL762.
Formerly: EDPS735.

TLPL763 Phenomenological Inquiry II (3 Credits)
This advanced course in phenomenological methodology provides an expanded philosophic and methodological grounding for conducting phenomenological research. Attention is given to the development of phenomenological projects through the process of phenomenological writing. It is especially relevant for persons interested in the study of lived meanings in the domains of education, psychology, counseling, the health sciences and related academic and professional fields.
Prerequisite: TLPL762.
Credit Only Granted for: EDPS736 or TLPL763.
Formerly: EDPS736.

TLPL764 Data Management and Coding in Stata (1 Credit)
School districts and states are required to collect large swaths of data on students, teachers, and schools. These large administrative datasets have become the backbone of education policy research, and so students interested in engaging in this space increasingly need the skills to work with "big data." This course will help students learn a coding language from the program Stata in order to clean and analyze large datasets. Topics covered include: data cleaning, recoding and checking; merging data from multiple sources; reshaping data; documenting processes; writing programs and macros to reduce errors; and presenting descriptive data through tables and graphs.
Recommended: Some prior experience with data management and statistical programming software (namely Stata) and with applied statistics.
Credit Only Granted for: TLPL788D or TLPL764.
Formerly: TLPL788D.

TLPL765 Quantitative Applicaltions for Education Policy Analysis (3 Credits)
Students use quantitative applications and secondary datasets to investigate social problems and education policies. Emphasis on the use of quasi-experimental designs and regression techniques to frame education issues, analyze, and recommend policies.
Prerequisite: EDMS645; or students who have taken courses with comparable content may contact the department.
Recommended: EDMS646; or EDMS651. Or EDMS646; and EDMS651.
Credit Only Granted for: EDPS703 or TLPL765.
Formerly: EDPS703.

TLPL766 Impact Evaluation for Education and Public Policy (3 Credits)
Students will learn about and practice using a variety of quantitative research methods that allow for causal inferences and can be applied to estimate the impact of policies or programs in education and other policy sectors.
Prerequisite: Knowledge of multivariate regression and prior experience with statistical programming software (e.g., Stata). TLPL765 or permission from instructor.
Credit Only Granted for: TLPL766, TLPL672, or EDPS621.
Formerly: TLPL672.

TLPL767 Law, Equity, and Diversity in Education (3 Credits)
An examination of 'dilemmas of difference' on selected issues that arise at the intersection of law and education policy. Dilemmas and value conflicts imbedded in modern federal and state case law dealing with race, gender, sexual orientation, religion and disability.
Credit Only Granted for: TLPL767 or EDPS751.
Formerly: EDPS751.

TLPL768 Research Development Workshop (1 Credit)
This seminar course centers student presentations of their research ideas and work and talks by invited faculty and external speakers. The course is led by faculty in the Education Policy and Leadership program, though students from other fields are encouraged to enroll.
Repeatable to: 4 credits.

TLPL770 Black and Latino Education: History and Policy (3 Credits)
Examination of the historical legacies and contemporary policies that have contributed to the educational status (K-20) of Blacks and Latinos in the United States from the 19th century to the present. Issues surrounding language, immigration, racism, social class, and state and federal policies will also be analyzed.
Recommended: EDCI776; and completion of EDSP611 recommended.
Credit Only Granted for: EDCI786 or TLPL770.
Formerly: EDCI786.

TLPL771 Pedagogy of Teacher Education (3 Credits)
Illuminates and challenges the somewhat implicit pedagogies of teacher education that have existed over time, and aims to develop a more overt knowledge of where the field is, and should be, as we engage in the opportunities and challenges of teaching and teacher education in our current era. To do so, we examine teacher education as racialized, linguicized, and gendered, and as situated in larger political and power-laden contexts.
Restriction: Permission of department.
Credit Only Granted for: EDCI780 or TLPL771.
Formerly: EDCI780.

TLPL772 Teaching, Professional Development and School Change (3 Credits)
Examines currrent scholarship on professional development for K-12 teachers, characteristics of good professional development, and its relationship to teaching, learning, and school improvement.
Credit Only Granted for: EDCI784 or TLPL772.
Formerly: EDCI784.

TLPL773 Theory and Research in Social Studies Education (3 Credits)
A survey of the research literature; evaluation of research techniques; consideration of relevant instructional curriculum theory; evaluation of modern teaching methods and techniques.
Prerequisite: TLPL684; or TLPL685.
Credit Only Granted for: EDCI720 or TLPL773.
Formerly: EDCI720.

TLPL774 Urban Education (3 Credits)
This seminar provides students with a broad overview of urban education as a field of inquiry by examining the social context of urban schools, how transformative pedagogy is practiced and conceptualized as well as school reform.
Credit Only Granted for: EDCI776 or TLPL774.
Formerly: EDCI776.

TLPL775 Power, Privilege, Diversity and Teaching (3 Credits)
This course critically examines the theoretic foundation of multicultural education with particular emphasis on the relationship between power, privilege, diversity and teaching.
Credit Only Granted for: EDCI782 or TLPL775.
Formerly: EDCI782.

TLPL776 Race and Whiteness in Education (3 Credits)
This course asks: what is whiteness, white supremacy, and white privilege, and how do they function in U.S. educational systems? Students interrogate white onto-epistemologies and white settler-colonial logics; social constructions (and reconstructions) of race and whiteness; and institutional, structural, and systemic racism via research, teaching, policies, and practice.
Credit Only Granted for: TLPL776 or TLPL788U.
Formerly: TLPL788U.

TLPL777 Critical Race Theory in Education (3 Credits)
This course asks: what is the function of racism, and how do we work toward a more racially just education system, if racism is permanent? Students learn tenets of Critical Race Theory and related frameworks (e.g., BlackCrit, AsianCrit, UndocuCrit, LatCrit, TribalCrit) and engage in counterstorytelling to amplify the experiences of Black, Indigenous, Latine, Asian, and other non-Black people of Color.
Recommended: TLPL776.
Credit Only Granted for: TLPL777 or TLPL788G.
Formerly: TLPL788G.

TLPL778 Scholarly Thought and Contemporary Curriculum (1-3 Credits)
Current curricular trends, issues, theory, and research in the light of past curricular and social thought.
Restriction: Permission of EDUC-Human Development and Quantitative Methodology department.
Repeatable to: 6 credits.
Formerly: EDPS738.

TLPL779 Select Topics in Education (1-3 Credits)
Special and intensive treatment of current topics and issues in teaching, learning, policy, and leadership.
Repeatable to: 6 credits.

TLPL780 Contested Control: School Choice, Localism, and Centralization (3 Credits)
Taking the local school district as its field of inquiry, this course will examine a series of common, seemingly unobjectionable terms--"democracy," "markets," "choice," "public," "private," etc.--each of which represents very different visions of school governance and political organization. Readings will explore the nature of social justice, efficacy, and civic participation within school districts, and will do so not merely through a lens of power but of authority in the sense of moral legitimacy. Ultimately, the readings return to one simple question: Who should control the schools? Through its examination of school district governance, this course will prepare students for work in local and state policy. It will also approach issues from a variety of ideological perspectives and bolster students' knowledge of historical, philosophical, and political approaches to education.
Credit Only Granted for: TLPL788X or TLPL780.
Formerly: TLPL788X.

TLPL781 Policy and Politics of Education Reform (3 Credits)
Examines enduring issues embedded in the recurrent efforts to reform US public schools, such as: How do we achieve the "elusive ideal" of equitable educational opportunity for all students? How might we structure public school systems and develop their capacity to meet the multiple academic, social, economic, political, and cultural responsibilities governments assign to them? Under what conditions might market-based initiatives be a viable reform option? What sorts of education and social policies may be required to improve the learning experiences and life chances of children and youth in the US? This course provides opportunities to analyze prominent approaches to education reform (e.g. altering governance arrangements, expanding access and opportunity, improving instruction, instituting standards-based high stakes accountability systems, expanding school choice, privatizing the management and delivery of educational programs, linking school reform to more comprehensive social services and safety nets). It also provides opportunities to analyze the political forces that give rise to various genres of education reform proposals.
Credit Only Granted for: TLPL788F, PLCY732 or TLPL781.
Formerly: TLPL788F.

TLPL783 Critical Ethnographic Research Methods (3 Credits)
This course asks: why are you the person to study and tell the story of a community? Through critical ethnographic research methods and methodologies, students are invited to be self-reflexive and interrogate what it means to learn from, engage with, and tell stories about marginalized communities in racial/social justice research.
Credit Only Granted for: TLPL788R or TLPL783.
Formerly: TLPL788R.

TLPL784 Participatory Action Research (3 Credits)
Considers methods the theoretical, epistemological, methodological, and ethical foundations of participatory action research and the ethical and political decisions involved in conducting empirical research with local community members. Students read literature on and exemplars of multiple approaches to participatory action research with various populations. This is a theoretical, rather than an applied, research course.
Prerequisite: Students must have taken a introductory qualitative or mixed-methods research course or have engaged in empirical research.
Credit Only Granted for: TLPL784 or TLPL788L.
Formerly: TLPL788L.

TLPL785 School Exclusion: Policy, Practice, and Intervention (3 Credits)
Examines the social, legal, policy, and practical contexts of school exclusion in the U.S. from historical and contemporary perspectives. With an eye towards youth advocacy, students will improve their theoretical, empirical, legal, and practical understandings of various mechanisms of school exclusion and their impact on different social groups.
Credit Only Granted for: TLPL785 or TLPL788N.
Formerly: TLPL788N.

TLPL786 School Finance and Business Administration (3 Credits)
Introduction to principles and practices in the administration of the public school finance activity. Sources of tax revenue, the budget, and the function of finance in the educational program are considered.
Credit Only Granted for: EDPS676 or TLPL786.
Formerly: EDPS676.

TLPL787 Professional Seminar in Urban Education (3 Credits)
Acclimates students in the Urban Education specialization to the field of urban education and graduate level academic work and builds a supportive cohort of students with related academic interests.
Restriction: Must be a first-year student in the Teaching and Learning, Policy and Leadership M.A. or Ph.D. program, Urban Education specialization.
Credit Only Granted for: TLPL787 or TLPL788E.
Formerly: TLPL788E.

TLPL788 Special Topics in Education (1-3 Credits)
Special and intensive treatment of current topics and issues in teaching, learning, policy and leadership.
Restriction: Permission of EDUC-Teaching and Learning, Policy and Leadership department.
Repeatable to: 6 credits.

TLPL789 Internship in Education (1-3 Credits)
Approved professional experiences with appropriate supervision. Open only to students admitted to approved master's and doctoral specializations.
Repeatable to: 3 credits if content differs.
Credit Only Granted for: EDPS789 or TLPL789.
Formerly: EDPS789.

TLPL790 Seminar in Mixed Methods Research in Education (3 Credits)
Examination of epistemological and methodological issues involved in conducting mixed methods studies in education. Students design and conduct analyses using existing datasets that include qualitative and quantitative data. They formulate appropriate research questions, consider alternative mixed methods designs, and address methodological complexities associated with working with qualitative and quantitative data in a single study.
Prerequisite: EDMS646; and (EDCI791 or EDHI700); and permission of EDUC-Teaching and Learning, Policy and Leadership department.
Recommended: EDCI792.
Credit Only Granted for: EDCI775 or TLPL790.
Formerly: EDCI775.

TLPL791 Qualitative Research I: Design and Fieldwork (3 Credits)
Examines the theoretical and epistemological moorings of different types of qualitative research. Students apply selected field research methods to problems of professional practice in schools and communities while considering central issues and dilemmas that arise while engaging in fieldwork.
Prerequisite: EDCI790.
Credit Only Granted for: EDCI791 or TLPL791.
Formerly: EDCI791.

TLPL792 Qualitative Research II: Analysis and Interpretation of Data (3 Credits)
Considers methods of on-going data analysis, ways of knowing and writing about field research, issues of reflexivity, and the ethical and political decisions involved in crafting text. Students read literature on and exemplars of multiple modes of qualitative data analysis and interpretation.
Prerequisite: TLPL791.
Credit Only Granted for: TLPL792 or EDCI792.
Formerly: EDCI792.

TLPL793 Methods of Discourse Analysis (3 Credits)
Surveys the various theoretical and methodological frameworks for doing discourse analytic investigations across disciplines.
Credit Only Granted for: EDCI788B or TLPL793.
Formerly: EDCI788B.

TLPL794 Foundations of Educational Research I (3 Credits)
An introduction to the "contested terrain" of education research. It examines major conceptual, methodological and political issues embedded in efforts to carry out education research and focuses on the development of the analytic dispositions and communication skills required to carry out research that meets the variously defined quality, utility and significance standards of scholarship in the field.
Restriction: Must be in Teaching and Learning, Policy and Leadership (Doctoral) program.
Credit Only Granted for: EDPS788P or TLPL794.
Formerly: EDPS788P.

TLPL795 Foundations of Educational Research II (3 Credits)
Students engage in the process of conceptualizing and completing a rigorous review of a section of literature in their area of specialization.
Restriction: Must be in Teaching and Learning, Policy and Leadership (Doctoral) program.
Credit Only Granted for: EDPS788T or TLPL795.
Formerly: EDPS788T.

TLPL798 Special Problems in Education (1-6 Credits)
Exploration of current problems in teaching, learning, policy and leadership. Available only to master's or doctoral candidates under the direction of their advisors.
Formerly: EDPL798.

TLPL799 Master's Thesis Research (1-6 Credits)
Formerly: EDPS799.

TLPL820 Seminar in Science Education (3 Credits)
Credit Only Granted for: EDCI870 or TLPL820.
Formerly: EDCI870.

TLPL828 Seminar in Mathematics Education (1-3 Credits)
Survey and analysis of literature on an identified research topic in mathematics education. Design and implementation of a research study to investigate the identified topic.
Repeatable to: 6 credits.
Credit Only Granted for: EDCI858 or TLPL828.
Formerly: EDCI858.

TLPL830 Seminar in English Education (3 Credits)
Credit Only Granted for: EDCI840 or TLPL830.
Formerly: EDCI840.

TLPL840 Seminar in Reading Education (3 Credits)
Credit Only Granted for: EDCI860 or TLPL840.
Formerly: EDCI860.

TLPL841 Research Methods in Reading (3 Credits)
Current research questions and methods culminating in a study suitable for submission to journals. Emphasis on using and conducting research.
Credit Only Granted for: EDCI861 or TLPL841.
Formerly: EDCI861.

TLPL860 Seminar on Case Study Methods (3 Credits)
Conceived as both an analysis of case study methods and a laboroatory for applying course content to research topics or projects of interest to students, it addresses a range of conceptual, methodological, ethical, political, and logistical issues embedded in efforts to conduct thoughtful, "disciplined" case study research. Since this focuses on case study research, it may be particularly helpful to students who are exploring various approaches to research or who are contemplating using case study methods in their theises and/or dissertations.
Credit Only Granted for: EDPS730 or TLPL860.
Formerly: EDPS730.

TLPL861 Seminar in Social Studies Education (3 Credits)
Credit Only Granted for: EDCI820 or TLPL861.
Formerly: EDCI820.

TLPL862 Race, Class, and Social Justice: A Policy Seminar in Curriculum Theory and Development (3 Credits)
An advanced seminar focusing upon critical analyses of the themes, concepts, and language relevant to Curriculum Theory, Policy, and Research. Focus on education policy issues relating to race, class, and social justice with special reference to patterns of economic and cultural distribution, their impact upon persons at society's margins and on specific curricular responses to injustice.
Prerequisite: TLPL693.
Restriction: Permission of EDUC-Teaching and Learning, Policy and Leadership department.
Credit Only Granted for: EDPS837 or TLPL862.
Formerly: EDPS837.

TLPL868 Seminar in Teacher Education and Professional Development (1 Credit)
This course brings together graduate students and faculty who have interest in research and practical topics related to teacher education and professional development, to discuss current research, discuss problems of practice, share emerging research with peers, and build a community of practice.
Repeatable to: 3 credits.
Credit Only Granted for: TLPL788Q or TLPL868.
Formerly: TLPL788Q.

TLPL888 Apprenticeship in Education (1-8 Credits)
Apprentice practice under professional supervision in an area of competence compatible with the student's professional goals. Credit not to be granted for experience accrued prior to registration. Open only to degree- and certificate-seeking graduate students.
Restriction: Permission of EDUC-Teaching and Learning, Policy and Leadership department.
Credit Only Granted for: EDPS888 or TLPL888.
Formerly: EDPS888.

TLPL889 Internship in Education (3-8 Credits)
Internship experiences at a professional level of competence in a particular role with appropriate supervision. Credit not to be granted for experience accrued prior to registration. Open only to students advanced to candidacy for doctoral degree.
Restriction: Permission of EDUC-Teaching and Learning, Policy and Leadership department.
Credit Only Granted for: EDPS889 or TLPL889.
Formerly: EDPS889.

TLPL898 Pre-Candidacy Research (1-8 Credits)
Credit Only Granted for: EDPS898 or TLPL898.
Formerly: EDPS898.

TLPL899 Doctoral Dissertation Research (1-8 Credits)
Registration required to the extent of 6-9 hours for an Ed.D. Project and 12-18 hours for a Ph.D. Dissertation.
Formerly: EDPS899.

TLTC - Teaching and Learning Transformation Center

TLTC499 Independent Study in Teaching and Learning (1-3 Credits)
Earn academic credit for the time spent supporting TLTC's educational development programs and/or engaging in the scholarship of teaching and learning.
Restriction: Permission of TLTC required - enrollment restriction.
Repeatable to: 6 credits.

TLTC699 Special Topics in University Teaching and Learning (1-3 Credits)
Special topics seminars for graduate students interested in university teaching and learning.
Restriction: Permission of TLTC-Teaching and Learning Transformation Center.
Repeatable to: 6 credits if content differs.

TLTC708 Independent Study: Learning Analytics Research Group (1-3 Credits)
A graduate level group research course designed to support independent study of learning analytics at the University of Maryland.
Restriction: Permission of instructor.
Repeatable to: 6 credits if content differs.

TLTC798 University Teaching and Learning (1-2 Credits)
Special topic courses directed at experienced graduate teaching assistants who are interested in university teaching and learning issues. Can be used by students for participation in the Universtiy Teaching and Learning Program.
Restriction: Permission of TLTC-Teaching and Learning Transformation Center.
Repeatable to: 6 credits if content differs.
Formerly: UNIV798.

TOXI - Toxicology

TOXI609 Methods in Toxicology (1-3 Credits)
Provides the opportunity for graduate students to become familiar with laboratory methods used by the staff to study the effect of toxins and environmental pollutants on living systems. Permission and credit arranged individually.
Restriction: Permission of CMNS-Chemical & Life Sciences department.
Repeatable to: 6 credits.

TOXI799 Masters Thesis Research (1-6 Credits)
Restriction: Permission of SPHL-Maryland Institute for Applied Environmental Health.

TOXI898 Pre-Candidacy Research (1-8 Credits)

TOXI899 Doctoral Dissertation Research (1-8 Credits)
Restriction: Permission of SPHL-Maryland Institute for Applied Environmental Health.

UMEI - Maryland English Institute

UMEI001 English as a Foreign Language: Beginning (12 Credits)
Intensive course for the non-native speaker of English who has little or no previous knowledge of English. Focus on the rapid acquisition of the basic features of English grammar and pronunciation and on speaking and understanding American English; reading and writing appropriate to the level will be included. Special fee required for this course. This course does not carry credit towards any degree at the University and does not count in the retention plan.
Restriction: Permission of EDUC-Dean-Maryland English Institute department.

UMEI002 English as a Foreign Language: Intermediate I (12 Credits)
Intensive course for the non-native speaker of English who has had some previous instruction in English. Emphasis on improving listening and speaking skills, on mastering intermediate grammatical structures, and on expanding vocabulary. Includes practice in reading and writing appropriate to the level. Special fee required for this course. This course does not carry credit towards any degree at the University and does not count in the retention plan.
Restriction: Permission of EDUC-Dean-Maryland English Institute department.

UMEI003 English as a Foreign Language: Intermediate II (12 Credits)
Intensive course for the non-native speaker of English who has mastered the essential structures of English grammar. Emphasis on improving communicative skills for a wide range of linguistic situations, on rapid expansion of vocabulary, and on improving reading comprehension and basic writing skills. Special fee required for this course. This course does not carry credit towards any degree at the University and does not count in the retention plan.
Restriction: Permission of EDUC-Dean-Maryland English Institute department.

UMEI004 English as a Foreign Language: Intermediate III (12 Credits)
Intensive course for the non-native speaker of English who has a good command of the basic features of spoken and written English. Emphasis on refining speaking and listening skills, on improving reading speed and comprehension of academic texts, and on developing writing skills for academic courses. Special fee required for this course. This course does not carry credit towards any degree at the University and does not count in the retention plan.
Restriction: Permission of EDUC-Dean-Maryland English Institute department.

UMEI005 Advanced English as a Foreign Language (6 Credits)
Semi-intensive course for the nearly proficient non-native speaker of English needing additional language instruction prior to undertaking full-time academic study. Speaking and listening skills; improvement of reading speed and comprehension; and development of writing skills. Special fee required for this course. This course does not carry credit towards any degree at the University and does not count in the retention plan.

UMEI011 Integrated English: Elementary (5-10 Credits)
English as a Second Language course for students at the elementary level.
Prerequisite: Placement exam; and permission of EDUC-Dean-Maryland English Institute department.

UMEI012 Integrated English: Intermediate (5-10 Credits)
English as a Second Language course for students at the intermediate level.
Prerequisite: Placement exam; and permission of EDUC-Dean-Maryland English Institute department.

UMEI013 Integrated English: Advanced (5-10 Credits)
English as a Second Language for students at the advanced level.
Prerequisite: Placement exam; and permission of EDUC-Dean-Maryland English Institute department.

UMEI028 Special Topics in English as a Second Language (1-2 Credits)
Focuses on particular English language topics for ESL student as indicated by title. Course intended to be taken concurrently with UMEI011, UMEI012, or UMEI013; but may be taken independently with special permission.
Repeatable to: 18 credits if content differs.

UNIV - University Courses

UNIV798 Special Topics Colloquium on University Teaching and Learning (1-3 Credits)
Special topic courses directed at experienced graduate teaching assistants who are interested in university teaching and learning issues. Can be used by students for participation in the Universtiy Teaching and Learning Program.
Restriction: Permission of UGST-Undergraduate Studies.
Repeatable to: 6 credits if content differs.

URSP - Urban Studies and Planning

URSP488 Selected Topics in Urban Studies and Planning (1-3 Credits)
Topics of special interest to advanced urban studies students.
Prerequisite: Permission of ARCH-Urban Studies & Planning Program program.
Repeatable to: 6 credits if content differs.

URSP600 Research Design and Application (3 Credits)
Techniques in urban research, policy analysis, and planning. Survey of descriptive and normative models. Objective and subjective measurements. Emphasis on assumptions of research.
Formerly: URSP602.

URSP601 Research Methods (3 Credits)
Use of measurement, statistics, quantitative analysis, and micro-computers in urban studies and planning.
Recommended: An undergraduate-level statistics course; and familiarity with Microsoft Excel.
Formerly: URBS601.

URSP603 Land Use Planning: Concepts and Techniques (3 Credits)
Land use concepts and definitions: legal context for planning; markets and planning; planning for housing; community services, employment, utilities, and transportation; zoning; subdivision regulations; growth management; plan implementation.
Credit Only Granted for: URSP603, URBS680, or URBS603.
Formerly: URBS603.

URSP604 The Planning Process (3 Credits)
Legal framework for U.S. planning; approaches to the planning process; tools and technology; systems thinking; defining problems and issues; soliciting goals and values; developing and making good presentations; public participation; developing and evaluating alternatives and scenarios; plan evaluation; developing RFPs.
Credit Only Granted for: URSP604, URBS656, or URBS604.
Formerly: URBS604.

URSP605 Planning History and Theory (3 Credits)
Examination of key, selected major events and issues in U.S. planning history and the development of the Yplanning profession; exploration of major themes in planning theory and practical applications of them; and analysis of the relationship of history and theory.

URSP606 Planning Economics (3 Credits)
Resource allocation in a market economy, the nature of market failures, and the justifications for public sector intervention. The limits and possibilities for planning in a market economy.
Restriction: Must not have completed URSP630.
Credit Only Granted for: URSP606, URBS606, or URBS630.
Formerly: URBS606.

URSP611 Planning Technology: Introduction to Geographic Information Systems (3 Credits)
Introduces the fundamental concepts of spatial thinking and spatial analysis, as well as the basic-to-intermediate skills and techniques to apply to planning research and practice. It balances lectures on the core principles of Geographic Information Systems (GIS) with applied instruction on managing, processing, and interpreting spatial data, emphasizing hands-on experience to provide students with essential spatial analysis and mapping skills.
Restriction: Must have permission of URSP program.
Credit Only Granted for: URSP688L or URSP611.
Formerly: URSP688L.

URSP612 Intermediate Geographic Information Systems for Urban Planning (3 Credits)
Planners utilize technologies at multiple levels in their work. Whether planners work at the local, state, or federal level, for-profit or non-profit, urban or rural, or with targeted neighborhoods or regional entities, the necessity for planners to, at a minimum, understand GIS is paramount. Web GISis used to plan, develop, manage, and analyze geographies and their respective populations. Given the past, present, and assuredly future ubiquity of Geographic Information Systems (GIS), this course's major focus will be delving into Web GIS for applications used in planning via University-provide Esri ArcGIS Online software for Web GIS.
Restriction: Permission of the Urban Studies and Planning Program.
Credit Only Granted for: URSP612 or URSP688M.
Formerly: URSP688M.

URSP631 Transportation and Land Use (3 Credits)
The interrelationship between transportation and land use. What are the impacts of various transportation modes on land use patterns, and how can land use solutions influence travel demand. The integration of transportation into master planning and site impact analysis. Using quantitative methods to understand the land use and transportation linkage.

URSP632 Urban Transportation Policy and Planning (3 Credits)
Introduction to theories, concepts, and techniques useful in urban transportation policymaking and planning with an emphasis on economics and finance. Fundamental economic concepts applied to transportation, travel demand modeling, and forecasting. Examination of transportation policy and planning to seek better solutions to achieve efficiency, effectiveness, and equity in the supply, demand, and use of transportation infrastructure and services.
Restriction: Must be in the URSP program, or permission from URSP program.
Credit Only Granted for: URSP688N or URSP632.
Formerly: URSP688N.

URSP640 Growth Management and Environmental Planning (3 Credits)
Topics associated with growth management, defined as policies and strategies by which governments attempted to control the amount, location, pace, pattern and quality of development within their jurisdictions.

URSP661 City and Regional Economic Development Planning (3 Credits)
Spatial patterns of employment and populations, and models of urban and regional growth and decline. Focus on application of economic theory and urban planning techniques to issues of local economic development and planning.
Credit Only Granted for: URSP661, URBS440, or URBS661.
Formerly: URBS661.

URSP668 Recent Developments in Urban Studies (1-6 Credits)
Examination of selected current aspects of urban affairs and planning, including, for example, new cities and towns in the United States or neighborhood preservation in other countries. Location of course may be off-campus.
Repeatable to: 15 credits if content differs.

URSP671 Politics and Planning (3 Credits)
Examination of the practice of planning as a technical and a practice role. Attitudes of planners toward plan implementation. Development of effective roles for professional planners.
Formerly: URSP691.

URSP672 Planning & Design in the Multicultural Metropolis (3 Credits)
Explores theoretical, ethical, and practical questions about today's multicultural metropolis. It addresses trends racial and ethnic inequality and draws on theories of justice, multicultural and intercultural planning, and the politics of difference to explore opportunities for change. It examines planners' roles in dealing with conflicting and competing uses and users, fostering spaces that meet the needs of different groups, and promoting social and economic equity through the design of the built environment and urban policy.
Restriction: Must be in the URSP program, or permission from URSP program.
Credit Only Granted for: URSP688Z or URSP672.
Formerly: URSP688Z.

URSP673 Community Development (3 Credits)
Examines and identifies planning approaches and methods that can help communities - particularly low income communities - become stronger, more cohesive, and more capable of serving their interests. Examines urban poverty; urban politics; history, concepts and practice of community development; and community development approaches and methods.

URSP688 Recent Developments in Urban Studies (2-6 Credits)
Examination of selected current aspects of urban affairs and planning, including, for example, <"new towns"> in the United States or neighborhood preservation in Russia. Location of course may be off-campus.
Formerly: URBS688.

URSP705 Summer Community Planning Studio I (4 Credits)
Intensive community planning group field work, typically five days a week for four weeks. Often outside the USA. Application of class work to actual planning and policy challenges. Students seeking to meet the URSP studio requirement must also take URSP 706.
Restriction: Permission of instructor.

URSP706 Summer Community Planning Studio II (2 Credits)
Intensive analysis and report-preparation of work completed in URSP 705. Held in College Park. Students seeking to meet the URSP studio requirement must also take URSP 705.
Restriction: Permission of instructor.

URSP708 Community Planning Studio (2-6 Credits)
The Community Planning Studio is a "capstone" course intended to provide students with an opportunity to apply their knowledge and skills to analyze current, pressing planning issues, in a selected community and to produce a report containing recommendations for addressing those issues. In essence, students act as a consulting team for a community client.
Prerequisite: URSP605, URSP604, URSP601, and URSP600; and permission of ARCH-Urban Studies & Planning Program department.
Repeatable to: 6 credits.
Credit Only Granted for: URSP704 or URSP708.
Formerly: URSP704.

URSP709 Field Instruction (3-6 Credits)
Students will satisfy a 300-hour internship (20 hours for 15 weeks during the spring, 25 hours a week for 12 weeks during the summer). Suitable internships are approved by the Internship Coordinator or Instructor; they involve a significant amount of planning work (preferably in the student's are of interest) and provide an appropriate on-site supervisor. The Internship Coordinator will assist students in finding a suitable internship, but the ultimate responsibility rests with each student. Whether the internship is paid or not is a matter to be worked out between the student and the organization.
Prerequisite: URSP605, URSP604, and URSP600; or permission of ARCH-Urban Studies & Planning Program department.
Repeatable to: 6 credits.
Credit Only Granted for: URSP703 or URSP709.
Formerly: URSP703.

URSP710 Research Seminar: Urban Theory and Issues (3 Credits)
An advanced research seminar for M.A. and M.C.P. students preparing their final research projects.
Prerequisite: 15 credits in URSP courses.
Restriction: Must be in Urban and Regional Planning and Design (Doctoral) program.
Formerly: URBS710.

URSP788 Independent Study in Urban Studies and Planning (1-3 Credits)
Directed research and study of selected aspects of urban affairs.
Repeatable to: 6 credits if content differs.
Formerly: URBS788.

URSP798 Readings in Urban Studies and Planning (1-3 Credits)
Directed readings in selected aspects of urban affairs and planning.
Repeatable to: 6 credits if content differs.
Formerly: URBS798.

URSP799 Master's Thesis Research (1-6 Credits)
Formerly: URBS799.

URSP804 Advanced Planning Theory (3 Credits)
Relations between theory and practice in planning. Ways of developing and using knowledge in collective action. Challenges to organizing for planning, finding knowledge useful for planning and balancing social attachments with free inquiry.

URSP805 Seminar in Research Design (3 Credits)
Addresses fundamental aspects of research desing for Ph.D students in urban planning and policy-related fields. Topics include principles of research design, formulating a feasible hypothesis and identifying appropriate methodology for testing hypotheses eg. qualitative methods, quantitative methods, survey research. Writing of proposals and dissertation. Publication, presentation, and funding.
Prerequisite: URSP804 and URSP810.
Restriction: By permission of the Urban and Regional Planning and Design (URPD) PhD Program.

URSP810 Contemporary Metropolitan Issues (3 Credits)
Introduces Ph.D. students to current metropolitan issues. Focus is on the historical development of the issue, problem definition, methodological approaches to its study, methodological dilemmas, and the ways that different conclusions are translated into policy. Topics vary from semester to semester but include such topics as the spatial mismatch hpothesis, the impact of urban design and form on travel behavior, the impact of technology on urban form, the justification for historic preservation, and sustainable development.
Restriction: Must be in Urban and Regional Planning and Design (Doctoral) program.

URSP898 Pre-Candidacy Research (1-8 Credits)
Selected topics in Urban Studies and Planning. Topics will vary with the instructor.
Repeatable to: 6 credits if content differs.

URSP899 Doctoral Dissertation Research (1-8 Credits)
This course is a required course for the Ph.D program in Urban and Regional Planning and Design.

USLT - Latina/o Studies

USLT401 Latinas/os and US Popular Culture (3 Credits)
An examination of the relationship between Latinas/os and popular culture in the United States. Using theoretical lenses drawn from cultural studies, visual culture studies, critical race theory, borderlands theory, and feminism, the course analyzes multiple texts from time frames past and present. Explores issues such as exclusion from and inclusion within US identity, transnational identifications and cultural flows, ethnoracial stereotyping and resistance to it, and intersections of Latina/o identity with aspects of class, race, sexuality, and gender. Investigates art, TV, music, cinema, and everyday lived experience.
Credit Only Granted for: USLT401, USLT498B, or AMST498M.
Formerly: USLT498B.

USLT403 Citizens, Refugees, and Immigrants (3 Credits)
Citizenship, Refugee and Immigrant are guiding categories that often define the Latina/o community in the United States. Employing this analytical lens, this course critically engages with notions of exclusion and inclusion, which included documentation, status, race, gender, and power. To better understand how these ideas and processes work, students are introduced to the history of Latina/o migration, US immigration policies, racial formation theory, gender construction, borderland theory, and the politics of territoriality.
Credit Only Granted for: USLT403, USLT498I, AMST498N, or IMMR419D.
Formerly: USLT498I.

USLT420 U.S. Latinas/os on the Silver Screen: The Silent Era to the Present Day. (3 Credits)
Combining media theory and film history, this course considers the film industry's relationship to Latinidad, examining issues such as the shift from silent film to sound, the impact made on Latina/o images by the Second World War, and Latinas/os in the Red Scare. The second half of the course turns its attention to self-representation by Latina/o filmmakers and empathetic images created by whites in and after the 1970s. Some of the questions that the course addresses include: How have Latinas/os been depicted in Hollywood history? How have inter-American foreign relations shaped the US Latina/o image? How have Latina/o filmmakers confronted issues such as racism and sexism in the United States?
Credit Only Granted for: USLT420, USLT498A or AMST498G.
Formerly: USLT498A.

USLT430 Globalization and the Diversifying U.S. (3 Credits)
While often talked about as a recent phenomenon and one focused on capital, the ebbs and flows of globalization has a long history among Latina/o communities in the United States. The impact and consequences of globalization can be seen in US foreign policy in Latin America. For instance, Operation Bootstrap in Puerto Rico and the Maquiladores on the Mexico and U.S. border. At the same time, it has shaped immigration policies and the social. political and cultural experiences of Latina/o workers in the U.S. Often blamed for "taking " jobs, this course takes a deeper look at the concrete reasons for the rise of globalism and its impact on Latina/o communities in the US.
Credit Only Granted for: USLT430, USLT498N, AMST498W, or IMMR419J.
Formerly: USLT498N.

USLT450 Central Americans and the United States: Culture, Politics, and Community (3 Credits)
With attention to history, memory, politics, and culture, this course examines the relationships, conflicts, and exchanges of people and power between the United States and the Central American isthmus. We will investigate the role of the US government and military, as well as US corporate interests and US-backed dictatorships, in the culture, politics, and economy of nations including El Salvador, Nicaragua, Guatemala, and Honduras. Through literature, feature films, documentary films, theatre, poetry, and other mediums, the class will analyze responses to this history in Central American cultural productions originating both from the isthmus and from Central Americans living in the United States. In addition to US interventions in the Americas, the course will examine migration from Central America to North America and will conclude by exploring the lives and activities of Central Americans living in the USA.
Credit Only Granted for: AMST498C, USLT450 or USLT498D.
Formerly: USLT498D.

USLT460 Revolutions and Diasporas (3 Credits)
How have revolutions in Latin America influenced the history of US immigration, refugee, and asylum policies? How have they changed US history, culture, experience, geography, politics and the future? This course examines both the history of major revolutions in Latin America and their impact on Latinx diasporic and immigrant communities in the US. It investigates questions of slavery and freedom US expansionism, radical politics, Third World liberation movements, and the politics of asylum and US immigration policies. Students in the course will learn transnationalist, diasporic, borderlands and other forms of Latinx historical methods. In addition, the course will focus on race, class, gender, sexuality, and the politics of location.
Credit Only Granted for: USLT460, USLT498R, or AMST498B .
Formerly: USLT498R.

USLT480 Race and Nation in U.S. Cinema (3 Credits)
From the 1915 release of D.W. Griffith's The Birth of a Nation to the present, cinema has been a crucial medium through which cultural producers have advanced and contested concepts of ethnoracial and national identity in the US. This course adopts a historically-grounded practice of media criticism to understand the ideology and iconography of both Hollywood's studio system and independent cinema. The course requires students to examine film and identity through multiple, racial, methodological and theoretical lenses, including film history, and film and media theory. Focus will be the cinematic politics and poetics of racial exclusion and inclusion, empathy and disidentification, power and resistance, and the shaping of a national "imagined community." We will pursue how ideas about class, sexuality, gender, and disability have informed ideologies concerning race and nation. Classes will be divided between lecture, film viewings, and, most importantly, class discussions.
Credit Only Granted for: AMST498P, USLT480, or USLT498C.
Formerly: USLT498C.

USLT488 US Latina/o Senior Seminar (3 Credits)
A variable topics seminar that exposes students to interdisciplinary critical readings, writings, and research in U.S. Latina/o Studies. Interdisciplinary research methodologies are broadly addressed. Students will gain skills and practice in reading critical analytic texts and will develop writing skills.
Recommended: USLT202 or USLT201.
Restriction: Senior standing; and permission of instructor.
Repeatable to: 9 credits if content differs.

USLT498 US Latina/o Studies: Special Topics (3 Credits)
Specific content to be announced when courses are offered.
Prerequisite: USLT202 or USLT201.
Restriction: Junior standing or higher.
Repeatable to: 9 credits if content differs.

VMSC - Veterinary Medical Sciences

VMSC436 Animal Health Policy and Communication (3 Credits)
Intended for upper level students in Veterinary Medicine or Animal Science as well as other students who are interested in understanding how science and politics interact and influence animal health policy and how veterinarians and animal scientists can effectively communicate science to non-scientists such as legislators and policymakers.
Recommended: Completion of ANSC225 and ANSC340 recommend.
Cross-listed with: ANSC436.
Restriction: Must be in a major within the AGNR-Animal & Avian Sciences department; or permission of AGNR-VA-MD Regional COL Veterinary Med.
Credit Only Granted for: ANSC489A, ANSC436, or VMSC436.
Formerly: ANSC489A.

VMSC600 Infectious Disease Diagnosis and Interpretation (1 Credit)
A broad exposure to many different diagnostic techniques, the appropriate use of the tests, how they are to be interpreted and the possible consequences of the diagnosis.

VMSC610 Recombinant Viral Vectors (3 Credits)
A comprehensive presentation of information on the molecular biology of the most relevent viral vectors developed to date and give insight on vector contruction, purification and utilization. Also intended for students in virology and related fields as well as to those interested in the application of viral vectors to basic research.

VMSC660 Emerging and Re-emerging Infectious Diseases (2 Credits)
The global burden of emerging and re-emerging infectious diseases is growing and prompts the need for effective control of these pathogens. The objective of this course is to provide graduate students with knowledge of pathogenesis and transmission of globally evolving pathogens. Registered students for this course are expected to know fundamentals of infectious diseases. References from the peer reviewed journals will be provided to facilitate understanding of the selected topics. Opening of this course is necessary to help graduate students to stay up-to-date with currently emerging pathogens and their evolution with changes in environment. This course is complementary to other existing microbiology courses (i.e., Viral Pathogenesis) on campus. Lectures focus on an in-depth analysis of a variety of topics in current infectious diseases. The course highlights recently published literatures to evaluate evolving trends in infectious diseases. The covered topics include subjects related with various pathogens and their adaptation strategy to enhance pathogenicity and transmissibility. The lectures will also cover the control and prevention measures of these pathogens.

VMSC670 Molecular Epidemiology of Infectious Diseases (2 Credits)
Molecular epidemiology is a discipline that uses molecular microbiology tools to study the distribution and determinants of diseases in human and animal populations. This course will provide a comprehensive overview and detailed discussion of the core molecular approaches and recent technological advances that are and can be used to investigate the etiology, transmission, and control of infectious diseases in veterinary medicine and public health. Theoretical and practical aspects of various molecular biology methods will be discussed in the context of epidemiological studies of infectious diseases including both bacterial and viral infections of veterinary and zoonotic significance. Lecture topics will cover the principles and application of various molecular techniques to problems of infectious diseases; population and evolutionary genetics of pathogenic microorganisms; data analysis and interpretation. Lecture materials will also be supported with practical data analysis, literature review discussions, which will be student-driven that will critique relevant manuscripts via group discussions in the classroom.
Prerequisite: Students planning to take this course are expected to have had some backgrounds in infectious diseases and molecular biology.
Cross-listed with: EPIB670.

VMSC688 Special Topics in Veterinary Medical Sciences (1-4 Credits)
Lectures and discussions on current topics in veterinary medicine s as animal disease surveillance, risk analysis, molecular epidemiolo or fish pathology. Targeted at veterinary medicine (DVM) students a other graduate students with a background in veterinary medical sciences.
Prerequisite: Permission of AGNR-Veterinary Medicine Program department.
Repeatable to: 8 credits.

VMSC689 Use of Genomics and Proteomics in Infectious Disease (3 Credits)
Focus is placed on current biotechnological development and recent research breakthroughs in the field of genomics and proteomics as it relates to infectious disease and drug/vaccine development.
Recommended: BCHM463; and (BSCI330 or BSCI230); or by permission.
Repeatable to: 6 credits if content differs.

VMSC698 One Health Seminar (1-3 Credits)
"One Health" is an approach that recognizes that health of people is closely connected to health of animals and our shared environment. Outstanding leaders in the field will present ideas for analysis and discussion among class members. Topics will include presentation and discussion of scientific publications, current topics, and new methodologies.
Prerequisite: Permission of AGNR-Veterinary Medicine Program department.
Repeatable to: 6 credits.

VMSC699 Special Problems in Veterinary Medical Sciences (1-4 Credits)
Independent study of a specific problem related to veterinary medicine such as a disease outbreak, application of a new diagnostic test or a risk analysis related to animal health. Targeted at veterinary medicine (DVM) students and other graduate students with a background in veterinary medicine.
Prerequisite: Permission of faculty mentor.
Repeatable to: 8 credits.

VMSC700 Animal Health Policy and Communication (3 Credits)
An introduction to animal health policy with emphasis on understanding how science and politics interact and influence animal health policy and how veterinarians and animal scientists can effectively communicate science to non-scientists such as legislators and policymakers.
Recommended: ANSC225 and ANSC340.
Restriction: Must be in a major in AGNR-VA-MD Regional Col Veterinary Med; or must be in a major within the AGNR-Animal & Avian Sciences department; or must be in a major in PUAF-School of Public Policy; or permission of AGNR-VA-MD Regional Col Veterinary Med.

VMSC705 Genetics of Animal Viruses (2 Credits)
An advanced course that covers the structure and complexity of viral genomes, genome replication and expression, virus-host interactions, virus evolution, genetic principles and methodology applicable to animal viruses.

VMSC720 Viral Pathogenesis (2 Credits)
This course will teach graduate students about mechanisms of infections by animal and human viral pathogens, including virus-cell interactions, host responses, and consequences of virus infection. Particular attention will be focused on the molecular mechanisms of the interactions between virus and host.

VMSC758 Journal Club in Comparative Biomedical Sciences (1 Credit)
The Journal Club in Comparative Biomedical Sciences is a graduate-level student-driven course. Each student will pick a peer-reviewed journal article for individual presentation and group discussion. The articles will cover a wide variety of biomedical science topics based on student and group interests.
Repeatable to: 6 credits if content differs.

VMSC760 Immunology of Infectious Diseases (3 Credits)
An advanced graduate level course that focuses on the cutting-edge knowledge of immunity and recent research breakthroughs in the interactions between host immune system and infectious pathogen, and vaccine development

VMSC770 Advanced Topics in Immunology (2 Credits)
The objective of the course is to provide students with the advanced and cutting-edge knowledge and techniques of immunology as well as research advancement in important immunologic topics. A selection of immunology area will be specifically selected with emphasis on recent research breakthroughs in the field. Therefore, the topics will be different each academic year.
Prerequisite: VMSC760; or permission of instructor.

VMSC780 Parasites of Medical and Veterinary Importance (2 Credits)
Provides students with the basic knowledge of parasites as well as research advancement in important parasites of humans and animals. Particular attention will be given to parasite biology, pathogenesis, and host responses to parasitic infection. A selection of parasites of medical and veterinary importance will be specifically covered with emphasis on recent research breakthroughs in the field.
Restriction: Permission of instructor.

VMSC799 Thesis Research (1-6 Credits)
Repeatable to: 99 credits if content differs.

VMSC898 Pre-Candidacy Research (1-8 Credits)

VMSC899 Dissertation Research (1-8 Credits)
Repeatable to: 99 credits if content differs.

WGSS - Women, Gender and Sexuality Studies

WGSS408 Literature by Women Before 1800 (3 Credits)
Selected writings by women in the medieval and early modern era.
Prerequisite: Must have completed two English courses in literature; or permission of the Harriet Tubman Department of Women, Gender, and Sexuality Studies.
Cross-listed with: ENGL408.
Repeatable to: 9 credits if content differs.
Formerly: WMST408.

WGSS410 Women of the African Diaspora (3 Credits)
Explores the lives, experiences, and cultures of women of Africa and the African diaspora--African-America, the Caribbean, and Afro-Latin America. A variety of resources and materials will be used providing a distinctive interdisciplinary perspective.
Credit Only Granted for: WMST410 or WGSS410.
Formerly: WMST410.

WGSS420 Asian American Women: The Social Construction of Gender (3 Credits)
Examines the intersection of gender, race and class as it relates to Asian American women in the United States; how institutionalized cultural and social statuses of gender, race, ethnicity and social class produce and reproduce inequality with implications for Asian Americans and the broader society.
Cross-listed with: AAST420.
Restriction: Must not have completed WMST420.
Credit Only Granted for: AAST420, WMST420 or WGSS420.

WGSS422 Asian American Women and Gender (3 Credits)
Examines Asian/American cultural production along with theories of gender and sexuality in the field of Asian American Studies. We consider how Asian American femininities/masculinities are conceived and circulated, drawing from a diverse selection of twentieth-century and contemporary texts, films and images that connect Asian American bodies to ideas of absence, danger, inscrutability, hyper- or hypo-sexuality, and virulence. Beginning with early to mid-twentieth century representations, the course attends to theories that clarify the contested relationship between the East/West and Asia/U.S. Also examined are the methods through which bodies differentiated by sex, gender, and race are managed, surveilled, and rehabilitated, with close attention to the enduring legacies of American expansionism and conquest, anti-immigration policies in the U.S., and twentieth-century wars and occupations in Asia. The course engages Women of Color feminisms, queer theory, and disability studies.
Cross-listed with: AAST422.
Credit Only Granted for: AAST498G, AAST422, or WGSS 422.
Formerly: AAST498G.

WGSS425 Gender Roles and Social Institutions (3 Credits)
Relationship between gender roles and the structure of one or more social institutions (e.g., the economy, the family, the political system, religion, education). The incorporation of gender roles into social institutions; perpetuation or transformation of sex roles by social institutions; how changing gender roles affect social institutions.
Credit Only Granted for: SOCY425, WMST425 or WGSS425.
Formerly: WMST425.

WGSS428 Topics in Women, Gender, and Sexuality Studies (1-3 Credits)
Thematic exploration of a topic in women, gender, and sexuality studies.
Repeatable to: 9 credits if content differs.
Formerly: WMST428.

WGSS441 Feminism, AI, and Health (3 Credits)
Situated at the intersection of feminist theory, AI, and health care, this interdisciplinary course will investigate the sociopolitical and ethical implications of emerging technologies in medical contexts. Drawing on feminist critiques of technology, we will explore how systems of oppression--including sexism, racism, ableism, and colonialism--shape the design, deployment, and impact of AI in health care. Students will engage with scholarly texts, discussions, and activities to analyze the historical entanglement of gender, race, and health care; the epistemic foundations of feminist knowledge production; the ethics of datafication and surveillance; and the transformative potential of feminist praxis. Coursework will include case studies, debates, and a final project envisioning inclusive, justice-oriented futures for AI in health care.

WGSS444 Feminist Critical Theory (3 Credits)
Issues in contemporary feminist thought that have particular relevance to textual studies, such as theories of language, literature, culture, interpretation, and identity.
Prerequisite: WMST200, WGSS200, WMST250, WGSS250, or ENGL250.
Cross-listed with: ENGL444.
Credit Only Granted for: ENGL444, WMST444 or WGSS444.
Formerly: WMST444.

WGSS448 Literature by Women of Color (3 Credits)
Literature by women of color in the United States, Britain, and in colonial and post-colonial countries.
Prerequisite: Must complete two English courses in literature; or permission of the Harriet Tubman Department of Women, Gender, and Sexuality Studies.
Cross-listed with: ENGL448.
Repeatable to: 9 credits if content differs.
Formerly: WMST448.

WGSS452 Women in the Media (3 Credits)
Participation and portrayal of women in the mass media from colonial to contemporary times.
Cross-listed with: JOUR452.
Credit Only Granted for: JOUR452, WMST452 or WGSS452.
Formerly: WMST 452.

WGSS455 Women in Medieval Culture and Society (3 Credits)
Medieval women's identity and cultural roles: the condition, rank and rights of medieval women; their access to power; a study of women's writings and the constraints of social constructs upon the female authorial voice; and contemporary assumptions about women.
Cross-listed with: HIST495.
Credit Only Granted for: HIST495, WMST455 or WGSS455.
Formerly: WMST455.

WGSS456 Women and Society in the Middle East (3 Credits)
Examines the customs, values and institutions that have shaped women's experience in the Middle East in the past and in the contemporary Middle East.
Recommended: Prior coursework in Middle East studies or gender studies.
Cross-listed with: HIST492.
Credit Only Granted for: HIST492, WMST456 or WGSS456.
Formerly: WMST456.

WGSS457 Redefining Gender in the U.S., 1880-1935 (3 Credits)
Exploring changing perceptions of gender in the U.S., 1880-1935, and the impact of those changes on the day to day lives of men and women.
Credit Only Granted for: WGSS457 or WMST457.
Formerly: WMST457.

WGSS458 Literature by Women After 1800 (3 Credits)
Selected writings by women after 1800.
Prerequisite: Must have completed two English courses in literature; or permission of Harriet Tubman Department of Women, Gender, and Sexuality Studies.
Cross-listed with: ENGL458.
Repeatable to: 9 credits if content differs.
Formerly: WMST458.

WGSS468 Feminist Cultural Studies (3 Credits)
Each version of this course focuses on one or several forms of popular culture -- such as TV, music, film, cyber-culture, or genre fiction (for example, science fiction) -- and demonstrates how feminists value, critique and explain such forms. Tools of feminist cultural studies include economic and social analyses of power, race, sexuality, gender, class, nationality, religion, technology, and globalization processes.
Repeatable to: 9 credits if content differs.
Formerly: WMST468.

WGSS469 Study Abroad Special Topics IV (1-6 Credits)
Special topics course taken as part of an approved study abroad program.
Repeatable to: 15 credits if content differs.
Formerly: WMST469.

WGSS471 Women's Health (3 Credits)
The women's health movement from the perspective of consumerism and feminism. The physician-patient relationship in the gynecological and other medical settings. The gynecological exam, gynecological problems, contraception, abortion, pregnancy, breast and cervical cancer and surgical procedures. Psychological aspects of gynecological concerns.
Cross-listed with: HLTH471.
Restriction: Must be in a program in the Harriet Tubman Department of Women, Gender, and Sexuality Studies; or must be in a major within SPHL-Behavioral & Community Health department.
Credit Only Granted for: HLTH471, WMST471, or WGSS471..
Formerly: WMST471.

WGSS486 Advanced Feminist, Critical Race, and Queer Theories (3 Credits)
Provides undergraduates with a survey of foundational texts in the intersecting fields of feminist, critical race, and queer studies, as well as an overview of current scholarship in order to give students an opportunity to understand the origins and the development of these fields. This course is especially recommended for students interested in pursuing graduate education. Our discussions will be focused on the trajectories of these intellectual conversations as they have developed in the academy.
Prerequisite: WMST301 or permission of the Harriet Tubman Department of Women, Gender, and Sexuality Studies.

WGSS487 Advanced Projects Seminar in Gender, Race, and Queer Studies (3 Credits)
A research seminar that allows students to focus their developed skills on a single topic of their own choosing while meeting regularly in seminar to discuss, critique, support, and learn from their peers' projects and assessments. Students choose a topic based on their own interests and prior coursework, perform advanced research appropriate to the question, and formulate an appropriate method of presentation of their research findings. The culminating presentation may take the form of a written paper or a creative, digital, or activist project.
Prerequisite: WGSS301.
Restriction: Must be in an undergraduate program in the Harriet Tubman Department of Women, Gender, and Sexuality Studies.
Credit Only Granted for: WMST487 or WGSS487.
Formerly: WMST487.

WGSS488 Senior Seminar (3 Credits)
Seminar for advanced majors in women's studies or other students with appropriate preparation. Interdisciplinary topics will vary each semester.
Restriction: Permission of the Harriet Tubman Department of Women, Gender, and Sexuality Studies.
Repeatable to: 9 credits if content differs.
Formerly: WMST488.

WGSS489 Individual Research in Gender, Race and Queer Studies (3 Credits)
Allows students who wish to continue the research they began in WMST487 or WGSS487 to do so under the guidance of an individual faculty mentor. Each student taking this class will develop an individual syllabus based on the project on which they are working, with the goal of developing a work of scholarship specific to their interests that can serve as an entry point for graduate study or professional work.
Prerequisite: WMST487 or WGSS487.
Repeatable to: 9 credits.

WGSS491 Judaism and the Construction of Gender (3 Credits)
The study of Jewish culture, religious practice, communal authority, and literature through the frame of such critical categories of analysis as gender, sexuality, masculinity, power, ethics, and the feminine.
Prerequisite: 1 course in JWST; or 1 course in LGBT; or 1 course in WMST or WGSS.
Cross-listed with: JWST491.
Credit Only Granted for: JWST491, WMST491 or WGSS491.
Formerly: WMST491.

WGSS492 Sex, Gender, and Jewish Identity (3 Credits)
An exploration of Jewish embodiment, including dynamics related to biological sex, culturally-framed gender, and sexuality. Topics of discussion may include transgender and intersex Jews, stereotypes and gender performance, modesty, genetics, and body alteration. Focus is on contemporary Jewish culture, framed within the larger historical and textual tradition.
Prerequisite: 1 course in WGSS; or 1 course in JWST; or 1 course in LGBT; or permission of instructor.
Cross-listed with: JWST492, LGBT448W.
Credit Only Granted for: JWST492, JWST409G, LGBT448W, WMST498W or WGSS492.
Formerly: WMST498W and JWST409G.

WGSS496 African-American Women Filmmakers (3 Credits)
Examines the cinematic artistry of African-American women filmmakers and the ways in which these films address the dual and inseparable roles of race and gender.
Credit Only Granted for: WMST496 or WGSS496.
Formerly: WMST496.

WGSS497 Professional Development (1 Credit)
To assist students in thinking about the next step post-undergraduate degree and to think long term about the importance of their WMST degree in lifelong career, personal, and political development. This course will provide students an opportunity to reflect upon where they are going beyond the B.A. and develop ways to communicate how their coursework and experiences at UMD have prepared them for the next step. The course will focus on the practicalities of resume writing, internship or job searches, etc. but also on the specific challenges/opportunities of translating interdisciplinary training to professional internship or beyond-the B.A. sites. Students may take this course in preparation for their internship (working to select an appropriate internship that can translate well to post-undergraduate aspirations) or they may take it post-internship as they determine their post-graduation steps.
Prerequisite: 12 credits in LGBT, WMST or WGSS courses.
Restriction: Must have completed a minimum of 75 credits.
Credit Only Granted for: WMST497 or WGSS497.
Formerly: WMST497.

WGSS498 Advanced Special Topics in Women, Gender, and Sexuality Studies (1-3 Credits)
Advanced study of a thematic topic in women, gender, and sexuality studies.
Restriction: Permission of the Harriet Tubman Department of Women, Gender, and Sexuality Studies.
Repeatable to: 9 credits if content differs.
Formerly: WMST498.

WGSS498D Sex, Gender, and Sexuality in the Islamic World (3 Credits)

WGSS499 Independent Study (1-3 Credits)
Research and writing or specific readings on a topic selected by the student and supervised by a faculty member of the Women's Studies Department.
Prerequisite: 1 course in WMST or WGSS.
Restriction: Permission of the Harriet Tubman Department of Women, Gender, and Sexuality Studies.
Repeatable to: 9 credits if content differs.
Formerly: WMST499.

WGSS601 Theoretical Foundations in Women, Gender, and Sexuality Studies (3 Credits)
Examines fundamental concepts in the interdisciplinary field of Women, Gender, and Sexuality Studies. Engages intersectionality as a critical analytic and set of responses to structural power and domination. Provides students with a theoretical foundation for understanding gender, race, and sexuality as analytic categories operating in transnational and global contexts and intersecting with other categories of difference.
Prerequisite: WMST400 or WGSS302; or students who have taken courses with comparable content may contact the department.
Restriction: Must be in the Women, Gender and Sexuality Studies doctoral or graduate certificate program.
Credit Only Granted for: WMST601 or WGSS601.
Formerly: WMST601.

WGSS602 Methodologies and Epistemologies in Women, Gender, and Sexuality Studies (3 Credits)
Examines the politics and practice of knowledge production in the interdisciplinary field of Women, Gender, and Sexuality Studies. Explores how theory is connected to the formation of raced/gendered/sexed bodies, subjectivities, and existences that unsettle Eurocentric genealogies of disciplinary knowledge formation. Introduces students to methodological and epistemological frameworks for attending to the impact of relations of power and domination on how research and scholarship are created and defined within and across disciplinary boundaries, cultures, and paradigms.
Prerequisite: WMST400 or WGSS302; or permission of the Harriet Tubman Department of Women, Gender and Sexuality Studies.
Restriction: Must be in the Women, Gender and Sexuality Studies doctoral or graduate certificate programs.
Credit Only Granted for: WMST602 or WGSS602.
Formerly: WMST602.

WGSS618 Feminist Pedagogy (3 Credits)
Examines the higher education classroom from a feminist perspective through theory and analysis. Students are graduate teaching assistants with the Women's Studies department.
Restriction: Permission of ARHU-Harriet Tubman Department of Women, Gender, and Sexuality Studies.
Repeatable to: 9 credits.
Formerly: WMST618.

WGSS619 Women, Gender, and Sexuality Studies Teaching Practicum (1 Credit)
Provides WGSS graduate teaching assistants with ongoing regular faculty supervision during the semesters the students are teaching courses in the department.
Restriction: Must have permission of the Harriet Tubman Department of Women, Gender and Sexuality Studies; and must be a current WGSS teaching assistant.
Repeatable to: 8 credits if content differs.
Formerly: WMST619.

WGSS628 Women, Gender, and Sexuality Studies Colloquium (1 Credit)
An intensive advanced exploration of current problems and issues in women, gender, and sexuality studies.
Repeatable to: 12 credits if content differs.
Formerly: WMST628.

WGSS698 Special Topics in Women, Gender, and Sexuality Studies (1-3 Credits)
Advanced work in selected topics in Women, Gender, and Sexuality Studies
Prerequisite: WMST400 or WGSS302; or permission of the Harriet Tubman Department of Women, Gender, and Sexuality Studies.
Restriction: Must be in the Women, Gender and Sexuality Studies doctoral or graduate certificate program; or permission of the Harriet Tubman Department of Women, Gender, and Sexuality Studies.
Repeatable to: 12 credits if content differs.
Formerly: WMST698.

WGSS699 Independent Study (1-3 Credits)
Research and writing on specific readings on a topic selected by the student which is approved and supervised by a faculty member of the Harriet Tubman Department of Women, Gender, and Sexuality Studies.
Restriction: Permission of instructor.
Repeatable to: 9 credits.
Formerly: WMST699.

WGSS708 Research Seminar in Women, Gender, and Sexuality Studies (3 Credits)
Guides students through the process of developing a research article in Women, Gender, and Sexuality Studies from idea to completed draft, with a view to future publication. Students will work to build research skills and develop their individual projects within the structure, accountability, and collaboration of a seminar format. The work of the class will include arranging individual meetings with core and affiliate Harriet Tubman Department of Women, Gender, and Sexuality Studies faculty who can advise the student on their specific research area.
Restriction: Permission of instructor.
Repeatable to: 9 credits if content differs.
Formerly: WMST708.

WGSS709 Directed Independent Reading for Major Field Exam (1-6 Credits)
Directed reading in preparation for Major Field Exam. In consultation with their advisors, students identify, analyze, critique and synthesize material relevant to their major fields of inquiry. Grading will be based on combinations of oral performance in the bi-weekly meetings, production of annotated bibliographies and synthetic papers.
Restriction: Permission of Harriet Tubman Department of Women, Gender, and Sexuality Studies.
Repeatable to: 12 credits.
Formerly: WMST709.

WGSS799 Masters Thesis Research (1-6 Credits)
Master's Thesis Research
Repeatable to: 9 credits.
Formerly: WMST799.

WGSS898 Pre-Candidacy Research (1-8 Credits)
Pre-Candidacy Research
Repeatable to: 12 credits.
Formerly: WMST898.

WGSS899 Doctoral Dissertation Research (1-8 Credits)
Doctoral Dissertation Research
Repeatable to: 36 credits.
Formerly: WMST899 .